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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Chemical Information Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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80-0601. Matolcsy, G. (Plant Prot. Res. Inst., Budapest, Hungary) **Kornyezetkimelo peszticidek racionalis kutatasanak lehetosegei. [Rational study of environmentally safe pesticides.]** *Agrartud. Kozl.* 37(1): 105-115; 1978 (Hungarian).

The study of new, environmentally safe pesticides in Hungary is reviewed. The development of new pesticides is based upon the quantitative study of structure-effect relationships in general, and on the structural planning and modification of compounds on the basis of analogy. Using this approach 2-chloro- 4-alkyl-amino- 6-diacetonamino-*cis* triazines were developed. These compounds are comparable to the triazine herbicides, but the compounds are degraded into inactive metabolites by the next vegetation period.

80-0602. Kralovicova, A.; Kubala, V.; Krizikova, D. (Res. Inst. Agrochem. Tech., Bratislava, Czechoslovakia) **Systemovy fungicid triadimefon - vlastnosti a pouzitie. [Systemic fungicide triadimefon - properties and use.]** *Agrochemia* 18(12): 363-365; 1978 (25 references) (Slovak).

Bayleton (triadimefon), a broad-spectrum systemic fungicide, can be used safely as a seed dip, leaf spray, or soil disinfectant. The toxicological properties of Bayleton to non-target organisms are reviewed. The acute oral LD50 of Bayleton to male rats is 569 mg/kg and to female rats is 363 mg/kg. For mice the LD50 is 989-1071 mg/kg.

80-0603. Hrdy, I. (Dep. Toxicol. Insect, Entomol. Inst. CSAV, Prague, Czechoslovakia) **Soucasny stav a moznosti dalsiho vyuziti feromonu hmyzu v ochrane rostlin. [Current status and possibilities of further use of insect pheromones in plant protection.]** *Agrochemia* 19(5): 143-150; 1979 (28 references).

The potential of using pheromones for supervised pest monitoring (mapping of pest infestation, management of chemical control, short-term prognostication of damage) in agriculture is reviewed. The findings gained by this method with respect to fruit tree pests *Cydia pomonella, Argyroploce variegana, Adoxophyes orana, Enarmonia formosana, Anarsia lineatella,* the viticultural pests *Lobesia botrana, Eupoecilia ambiguella,* and cereal crop pests *Cydia nigricana, Argyrotaenia velutinana, Tortrix viridana* are described. The outlook for exploiting insect pheromones in practice is discussed. Most advanced knowledge is available on the sexual insect attractants, especially of butterflies, tortricids and moths. Sexual pheromones are primarily substances with long hydrocarbon chains consisting of several components and thereby specific for certain insect species. It is concluded that indiscriminate use of pheromones includes development of resistance.

80-0604. Hummel, R. A.; Shadoff, L. A. (Anal. Lab., Dow Chem. USA, Midland, MI 48640) **Specificity of low resolution gas chromatography low resolution mass spectrometry for the detection of tetrachlorodibenzo- *p*-dioxin in environmental samples.** *Anal. Chem.* 52(1): 191-192; 1980 (8 references).

In a letter to the editor the specificity of low resolution gas chromatography low resolution mass spectrometry (LR GC-LR MS) for the analysis of tetrachloro dibenzo-*p*-dioxin (TCDD) from cattle grazed on land treated with 2,4,5-T is discussed. All extracts were analyzed by LR GC-LR MS. Those beef fat samples with apparent positive results or at the limit of detection (above 20 ppt) were analyzed by LR GC high resolution MS (LR GC-HR MS). No false negative results were observed, indicating LR GC-LR MS is a satisfactory screening technique for TCDD in beef fat at levels of 20 ppt and higher. It is suggested that with this type of sample and cleanup, HR MS is required to check apparent positive results. False positives were noted in 2 HR MS control samples. LR GC- LR MS alone is considered to be an acceptable method if suitable control samples are available to show the absence of interference. It is suggested, however, that when there are no suitable controls or when clean-up is nonspecific, positive results must be confirmed by HR MS.

80-0605. DiBattista, L.; Ghezzo, F.; Orecchio, F.; Togna, G.; Tomasi, A. (Ist. Ig., Univ. Cattol. Sacro Cuore, Rome, Italy) **Sulla tossicita a breve ed a lungo termine degli inquinanti ambientali. Metodologie per la valutazione sperimentale. [Short and long term environmental toxicity. Methods for evaluation of experimental results.]** *Ann. Ist. Super. Sanita* 14(3): 701-704; 1978 (8 references).

The methodological aspects of an approach to the experimental study and evaluation of the short-term and long-term effects of toxic substances are discussed. The effects of pesticides in particular and the interaction of pesticides in the body are emphasized. Experimental results that demonstrate the impairment of enzyme activity by dithiocarbamates and herbicides are considered. Partial experimental confirmation of the hypothesis that chronic toxicity is the long-term effect of metabolic damage caused by exposure is also mentioned.

80-0606. Schmidt, H. U. (Inst. Vorratsschutz. Biol., Bundesanst. Land. Forstw., D-1000 Berlin 33, BRD) **Untersuchungen ueber die Wirkung von *Bacillus thuringiensis* Berliner auf die Dorrobstmotte (*Plodia interpunctella* Hbn.). [The efficiency of *Bacillus thuringiensis* Berliner in controlling the Indian meal moth (*Peodia interpunctella* Hbn.).]** *Anz. Schaedlingskd. Pflanz. Umweltschutz.* 52(3): 36-39; 1979 (19 references) (German).

The effectiveness of a Thuricide dust containing

Bacillus thuringiensis var. *kurstaki*, serotype 3a, 3b with a viable spore count of 6-10 x 10^6/mg and an insecticidal activity of 3.2 x 10^3 IU/mg, against larvae of Indian meal moth was studied in rye grains to which the preparation was applied. The mortality rates were 82% at a concentration of 20 mg/100g of grain (64 x 10^3 IU) and 99% at 120 mg/100g. The effectness of the preparation was not reduced during the 5 mo test at 12-28°C and a relative humidity of 75%. The larval stage of the survivors was prolonged by 3-4 wk. Surviving moths, whose larvae were grown on grain treated with the preparation, were fertile and presumably did not transmit the bacteria to the next generation.

80-0607. Thal, J. (Cent. Rech. Agron., Minist. Agric., Casablanca, Morocco) **Untersuchungen ueber das Vorkommen der Kartoffelmotte, *Phthorimaea operculella* Zeller (Lep., Gelechiidae), in Vorratslagern unter Verwendung von Pheromonfallen. [Studies on using sex pheromone traps for potato tuberworm moth control in storages.]** *Anz. Schaedlingskd. Pflanz. Unweltschutz.* 52(3): 44-47; 1979 (16 references) (German).

Two-component sex pheromone traps were used to detect infestation by *Phthorimaea operculella* Zeller in potato fields and potato storage facilities in Morocco. The trap contained 0.1 mg of *trans*-4-*cis*-7-tridecadienyl acetate and 0.3 mg of *trans*-4-*cis*-7-*cis*-10-tridecatrienyl acetate. The trap selectively attracted males.

80-0608. Tungikar, V. B.; Das, K. G. (Natl. Chem. Lab., Poona 8, India) **Controlled-release pesticide technology.** *Chem. Age India* 30(9): 829-830; 1979.

Controlled-release pesticide formulations are described and their advantages are discussed. Accidental exposures of farm workers and amount of environmental contamination by highly toxic pesticides are reduced by the use of controlled release formulations. This technology, which is ideally suited for rural small scale industries in developing countries, has the advantage of using less pesticide for the same period of activity, being less costly, minimizing dangers to personnel handling the chemical, and posing minimal threat to the environment. The pesticide can be released at a fast, slow, constant, or changing rate. Some commercially available controlled-release pesticide formulations are listed, including juvenile hormone mimics and plant growth regulators. Future plans for development of controlled-release larvicides and insecticides are mentioned.

80-0609. Kasbekar, M. G.; Sharma, V. S.; Subramanian, R. (Hindustan Lever Res. Cent., Chakala, Bombay 400093, India) **Plant growth regulators (PGR).** *Chem. Age India* 30(9): 831-837; 1979 (7 references).

The roles of natural and synthetic plant growth regulators in agriculture are discussed. Auxins, gibberellins, and cytokinins are natural growth promoters, while abscisic acid and ethylene are classified as growth retardants. A wide variety of chemicals which act like these natural plant hormones are sprayed on Indian crop fields for increased yields and for weed control. Listed among the most frequently used synthetic compounds are 2,4-D, 2,4,5-T, glyphosine, silvex, maleic hydrazide, and naphthalene acetic acid (NAA). Toxicity data on these herbicides and plant growth regulators as well as their principal uses are presented in tabular form.

80-0610. Roy, N. K.; Bedi, S. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi 110012, India) **The position of organophosphorous pesticides in India.** *Chem. Age India* 30(9): 859-867; 1979 (8 references).

The physical and biological properties of organophosphorous pesticides, and their production and uses in India are discussed. Estimated consumption rates of the most frequently used pesticides during 1977-78 include malathion (2045 tons), methyl parathion (1550 tons), dimethoate (645 tons), phosphamidon (440 tons), aluminum phosphide (420 tons), and fenitrothion (310 tons). Information on the toxicity data of 66 organophosphates are presented in tabular form.

80-0611. Corbett, J. R. (Fisons Agrochem. Div., Chesterford Park Res. Stn., Saffron Walden, Essex, England) **Technical considerations affecting the discovery of new pesticides.** *Chem. Ind. (London)* 22: 772-782; 1979 (71 references).

Technical factors which may either limit or extend innovations being made in the pesticide industry are reviewed. The need for the industry itself is discussed in some depth. It is suggested that the industry is no longer in the stage of rapid growth. Not only is it now much more difficult to find a novel commercial pesticide, but the cost of research and development has risen, and has become slightly prohibitive. A table comparing chemical and non-chemical control methods is included. Improved pesticide usage; chemicals with unconventional types of activity such as plant growth regulators and herbicide antidotes; insect behavior control with pheromones, allomones and kairomones; chemosterilants; synergists; and approaches to pesticide synthesis such as random synthesis, analogue synthesis, and predictive design are discussed.

80-0612. Hoch, P. E. (Western Res. Guigne Tech. Cent., Stauffer Chem. Co., Richmond, CA 94804) **Integrated pest management - its impact on US agrochemical companies.** *Chem. Ind. (London)* 22: 783-788; 1979 (16 references).

Various tools used in pest management attempts such as cultural practices, chemical control means, biological controls, use of pathogens, traps, host-plant resistance factors, sterile male release techniques, use of insect attractants, insect hormones, and insect growth regulators and antihormones are discussed. Factors which influence pest management tactics or strategies are also discussed, including monitoring methods, weather data, modeling attempts, and thresholds of economic damage. The evolution of integrated pest management ideas in the United States is reviewed. Consideration is also given to the impact of integrated pest management on the agrochemical industry in the United States.

80-0613. Buechel, K. H. (Bayer AG Bayerwerk, D-5090 Leverkrusen, BRD) **Impact of the agrochemicals industry on the third world.** *Chem. Ind. (London)* 22: 791-795; 1979.

Due to different sociological, economic, and ecological structures, the growth and current status of the pesticide industry in developing countries cannot be measured in terms similar to those used for western nations. Difficulties of development planning are reviewed. Both development concepts and agricultural concepts of these countries are discussed. The importance of crop protection in agricultural development concepts is discussed with emphasis given to health and hygiene, weed controls, cash crops, subsistence crops, staple food crops, and ecological misconceptions.

80-0614. See, R. M. (Virginia Polytech. Inst. & State Univ., Blacksburg, VA 24061) **Respiration as a potential metabolic site of antagonism between ethephon and SADH.** *Diss. Abstr. Int. B* 40(5): 1983-1984; 1979.

The effects of foliar applications of ethephon and SADH (daminozide) alone and in combination, on the growth of artificially established white pine seedlings (*Pinus strobus* L.) and resprouts of red maple (*Acer rubrum* L.) were studied. Shoot growth of white pine seedlings was not significantly affected by any of the treatments. Ethephon at 1.6 kg/ha reduced red maple shoot growth by approximately 50%, but also caused chlorosis and necrosis of treated leaves, defoliation and stem dieback. Ethephon in combination with SADH (1.6 + 1.6 kg/ha) inhibited red maple shoot growth by approximately 45%. Cells isolated from 5-day-old Black Valentine bean (*Phaseolus vulgaris* L.) plants were used to study the effects of ethephon and SADH on respiration and lipid synthesis. Ethephon (1.0 m*M*) promoted $^{14}CO_2$ evolution from cells incubated with ^{14}C-glucose for 14 hr by approximately 75%. SADH at 30.0 and 60.0 m*M* inhibited $^{14}CO_2$ evolution by 30 and 70%, respectively. Ethephon in combination with SADH (1.0 + 60.0 m*M*) resulted in a 32% inhibition of respiration. SADH inhibited the activity of membrane-bound succinate dehydrogenase. Inhibition was of the competitive type (apparent K_i, 20.2 m*M*). Comparisons of the effects of ethephon with an uncoupler of oxidative phosphorylation on oxygen uptake by mitochondria suggested that the stimulation of $^{14}CO_2$ evolution by isolated leaf cells caused by ethephon (1.0 mM) could not be attributed to ethephon acting as an uncoupler. These data support suggestions of antagonism between ethephon and SADH and emphasize respiration as one potential metabolic site of action. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7924141)

80-0615. Jorgensen, S. E. (Langkaer Vaenge, Vaerlose, Copenhagen, Denmark) **Modelling the distribution and effect of toxic substances.** *Ecol. Modelling* 6(3): 181; 1979.

In this editorial the importance of information on the distribution of toxic substances in the environment, and the effects of these substances on organisms is discussed. The use of this information in decisions concerning threshold limits, negative and positive lists, maximum permissible concentrations, and the development of predictive schemes is mentioned. It is suggested that passage of the Toxic Substances Act of 1976, increasing monetary fines, and continued development of data on the effects of toxic substances indicate an expansion in control measures, and that research in this area will continue to be needed.

80-0616. Brown, B. T.; Rattigan, B. M. (Div. Plant Ind., CSIRO, Canberra City, ACT, Australia) **Toxicity of soluble copper and other metal ions to *Elodea canadensis*.** *Environ. Pollut.* 20(4): 303-314; 1979 (31 references).

The phytotoxicity of copper and various other metal ions was studied using the submerged vascular plant *Elodea canadensis*. Copper was of particular interest because of its use as an aquatic herbicide. In order to determine short-term phytotoxicity, the reduction in light-induced oxygen evolution was measured in *Elodea* segments after a 24 hour contact with a metal ion. In long term experiments, *Elodea* plants were visually rated after exposure to a metal ion for 28 days. The metal ion concentrations required to reduce O_2 production rate to 50% that of untreated plant material (I_{50}) and to 10% of untreated plant material (I_{90}) were determined. The I_{50} values ranged from 0.10 mg/l for silver to 723 mg/l for nickel, with the value for copper being 0.15 mg/l. The concentrations producing 50% damage to whole plants after 28 days ranged from 0.90 mg/l for arsenic to 148 mg/l for cadmium, with the value for copper being 3.1 mg/l. The results are discussed in terms of the use of copper as an aquatic herbicide.

80-0617. Malins, D. C. (Northwest & Alaska Fish. Cent., Seattle, WA 98112) **Pollution of the marine environment.** *Environ. Sci. Technol.* 14(1): 32-37; 1980.

This review considers problems involved in

analysis of ocean water for contaminants which may be harmful to marine life. Most of the hydrocarbons which contaminate ocean waters are readily oxidized in these marine environments through chemical and biochemical reactions into various polar organic compounds. The toxicity of these compounds is not known and they are not quantifiable by gas chromatography, due in many cases to their low volatility and thermal instability. The availability of contaminants to organisms and the accumulation of contaminants in fish tissues are discussed. Laboratory and field studies investigating the accumulation of contaminants (PCBs, naphthalene, and various hydrocarbons) in fish tissues and related biological effects are mentioned. The transference of contamination (toxic metals, PCBs, and hydrocarbons) through food webs is also considered. The use of an interdisciplinary research technique to improve analytical capability and develop techniques for analysis of interactive effect (synergism and antagonism) between pollutants is suggested. It is also suggested that future research be directed toward understanding processes and obtaining data that can be applied in many different field and laboratory situations.

80-0618. Herczeg, T.; Lehoczki, E.; Szalay, L. (Inst. Biophys., Jozsef Attila Univ., H-46722 Szeged, Hungary) **The prompt effect of pyridazinone herbicides on the primary processes of photosynthesis.** *Febs Lett.* 108(1): 226-228; 1979 (13 references).

Chlorella pyrenoidosa (strain Emerson) was cultured in Tamiya medium, and later exposed to pyridazinone herbicides [San 6706, San 9785, and San 9789 (norflurazon)]. Results demonstrated that these herbicides were fairly strong inhibitors of the oxygen-evolving activity. However, when used at concentrations of $10^{-4}M$, these herbicides did not influence delayed luminescence. It was concluded that the 3 types of substituted pyridazinone herbicides are not DCMU-type inhibitors of photosynthesis, but instead act directly on the water-splitting enzyme.

80-0619. Bogen, G. (Author address not given) **Symptoms in Vietnam veterans exposed to Agent Orange.** *J. Am. Med. Assoc.* 242(22): 2391; 1979.

In a letter to the editor the results of a 10 mo study of 78 Vietnam veterans exposed to Agent Orange [herbicide containing equal parts of 2,4-dichloro phenoxyacetic acid (2,4-D) and 2,4,5-trichloro phenoxyacetic acid (2,4,5-T)] are presented. Symptoms found included skin rash, joint pain, stiffness, extreme fatigue, numbness, dizziness, depression, nausea, diarrhea, and blurred vision. The 2 most common genito-urinary findings were brown urine and hematuria. Cases of cancer, children with gross birth defects, miscarriages in subjects' wives, and sterility were also reported.

80-0620. Lambert, D. H.; Stouffer, R. F.; Cole, H. Jr. (Dep. Plant Pathol., Pennsylvania State Univ., University Park, PA 16802) **Stunting of peach seedlings following soil fumigation.** *J. Am. Soc. Hort. Sci.* 104(4): 433-435; 1979 (16 references).

Peach trees fumigated with 275 kg/ha MC-33 (67% methyl bromide and 33% chloropicrin) only reached about two-thirds of their normal size, and had stems smaller than normal. The plants were often unsuitable as rootstock for bud grafting. Eleven mo after fumigation soil, root, and foliage samples from the affected site were analyzed for pH, cation exchange capacity, and ion and salt content. Percent mycorrhizal colonization for fumigated peach trees was 1%, while non-treated plots averaged 78%. Foliar concentrations of P, Cu, and Zn in treated leaves were 0.55-0.58 times lower, Ca K, and Mg 0.79-0.87 times lower, and Fe, Mn, and Na concentrations were 1.97, 1.6, and 1.2 times lower, respectively, than those of non-stunted leaves. Lack of root colonization by mycorrhizae, and a shift in the uptake of ions by the trees may have contributed to the poor growth performance.

80-0621. Nickle, D. A. (Univ. Florida, Gainsville, FL 32661) **Insect growth regulators: new protectants against the almond moth in stored inshell peanuts.** *J. Econ. Entomol.* 72(6): 816-819; 1979 (15 references).

Four insect growth regulators (IGRs) were tested for ability to suppress populations of *Ephestia cautella* (Walker) in inshell peanuts. In laboratory tests, peanuts were sprayed with several concentrations of either hydroprene, methoprene, diflubenzuron, or Stauffer MV-678 (1- (8-methoxy-4,8- dimethylmonyl)- 4-(1-methylethyl) benzene) and infested with 200 eggs of almond moths. Concentrations below 100 ppm of all IGRs except diflubenzuron (hydroprene, 5 ppm; methoprene, 25 ppm; MV-678, 90 ppm) completely suppressed adult emergence. These IGRs also reduced fecundity at lower concentrations. MV-678 at ca. 30 ppm completely inhibited oviposition. Residues of hydroprene, methoprene, and MV-678 were as effective as residues of malathion (35 ppm) against the almond moth after at least 8 months of storage. (Author abstract by permission)

80-0622. Bull, D. L.; House, V. S.; Ables, J. R.; Morrison, R. K. (Cotton Insects Res. Lab., Agric. Res., SEA, USDA, College Station, TX 77840) **Selective methods for managing insect pests of cotton.** *J. Econ. Entomol.* 72(6): 841-846; 1979 (22 references).

In replicated tests in small field plots of cotton, application of a commercial formulation of *Bacillus thuringiensis* Berliner (BT) (1121 g/ha) did not adequately suppress heavy populations of *Heliothis* spp. larvae. When chlordimeform (140 g/ha) was applied in conjunction with this same dose, the level of control increased but did not exceed that provided by chlordimeform alone. Direct com-

parisons of the efficacy of the BT formulation (561 g/ha) and a commercial formulation of *Baculovirus heliothis* (BH) (148 g/ha) against *Heliothis* spp. indicated that the materials provided comparable levels of control against moderate populations of larvae. When the BH formulation (148 g/ha) or the BT formulation (560 g/ha) was applied in conjunction with releases of *Trichogramma* (110,000/ha) in test plots oversprayed with diflubenzuron (70g + 4.7 ℓ crop oil/ha) to control boll weevils, *Anthonomus grandis grandis* Boheman, the 2 microbial pesticides caused a similar and significant reduction (compared with the check) in the numbers of both small and large *Heliothis* spp. larvae. Numbers of undamaged bolls were also significantly greater in microbial-treated plots. (Author abstract by permission)

80-0623. Lublinkhof, J.; Lewis, L. C.; Berry, E. C. (Dep. Agric. Entomol., Univ. Illinois, Urbana IL 61801) **Effectiveness of integrating insecticides with *Nosema pyrausta* for suppressing populations of the European corn borer.** *J. Econ. Entomol.* 72(6): 880-883; 1979 (17 references).

The purpose of this study was to examine the potential of *Nosema pyrausta* Paillot when used in combination with microbial insecticide, *Bacillus thuringiensis* Berliner, and 2 carbamate insecticides, carbaryl and carbofuran, to suppress populations of the European corn borer. Plants receiving an application of *N. pyrausta* had significantly fewer larvae per plant than did those not receiving the application. Insecticides and *N. pyrausta* acted independently in 3 of 4 tests, and their effects were additive in terms of reducing larval populations of *Ostrinia nubilalis* (Hubner) and stalk cavities caused by this insect. If *N. pyrausta* could be established in a population as a result of its application, it is evident that this effect in combination with insecticides could provide a very effective pest-management strategy for suppressing populations of the European corn borer. (Aut'ıor abstract by permission)

80-0624. Reed, T.; Bass, M. H. (Zool. Entomol. Dep., Agric. Exp. Stn., Auburn Univ., Auburn, AL 36830) **Effects of diflubenzuron on food consumption by the soybean looper.** *J. Econ. Entomol.* 72(6): 912-913; 1979 (1 reference).

Larvae of *Pseudoplusia includens* (Walker) that fed continuously from the 5th instar on medium treated with the insect growth regulator diflubenzuron consumed decreasing amounts of medium as the dosage of diflubenzuron (DFB) applied to the medium surfaces increased. Fifth instars that fed continuously on DFB-treated medium and completed larval development consumed significantly less medium than controls. Soybean loopers that fed on DFB-treated medium beginning at the 6th instar consumed the same amount of medium as controls despite heavy postlarval mortality among the former. (Author abstract by permission)

80-0625. Gontarev, V. S.; Bondarenko, E. V. (Gomel' Oblast Agric. Exp. Stn., Gomel, USSR) **Khimicheskaia bor'ba s sorniakami v podpokrovnykh posevakh liutserny. [Chemical control of weeds in lucern crops grown under cover.]** *Khim. Sel'sk. Khoz.* 17(9): 29-31; 1979 (6 references) (Russian).

The effects of different herbicides and their combinations on crop yields, and on some qualitative parameters of alfalfa seeds and oat grains were studied in alfalfa catch crops in oat fields. The herbicides tested were 2M-4KhM (MCPB; 1.5-2 kg/ha), 2M-KhM + 2M-4Kh (MCPA), 2M-4Kh (0.8 kg/ha), 2,4-DM (2,4-D; 2.5 kg/ha), prometryne (0.5 kg/ha), and prometryne + 2,4-DM. All preparations except prometryne were applied after the emergence of alfalfa; prometryne was sprayed before emergence. The herbicides showed no toxic effects on the alfalfa plants and no herbicide residues were found in the oat grains. The herbicides did increase the starch content in the oat grains (44.9% in the non-weeded controls versus 45.6-49.7% in the samples from the treated plots). The treatment also caused a slight increase in the 1000-grain-weight of alfalfa (2.43-2.60 g versus 2.35 g in the controls).

80-0626. Narahashi, T. (Dep. Pharmacol., Northwestern Univ. Med. Sch., Chicago, IL 60611) **Neurotoxicology of insecticides and pheromones.** *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed. (NY: Plenum Press) pg. 308; 1979.

This book presents results of current research on the interaction of insecticides and pheromones with the nervous system. The nervous system as the major target site for pesticides and the importance of understanding the specific mechanism of action of pesticides are considered. The study of insecticide-nerve membrane interactions increases the understanding of molecular mechanisms of action and structure-activity relationships. Topics covered include pheromone perception and receptors, neurophysiology of insecticide action, and neurochemistry of insecticide action. Abstracts of items from this book will appear in the appropriate sections of this issue of *Pesticides Abstracts.*

80-0627. Payne, T. L. (Dep. Entomol. Texas Agric. Exp. Stn., Texas A&M Univ., College Station, TX 77843) **Pheromone and host odor perception in bark beetles.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed., (NY: Plenum Press) 27-57; 1979 (92 references).

Olfactory perception in bark beetles (Coleptera: Scolytidae) was studied to aid in the development of behavioral chemicals for use in pest management. Bark beetles were found to have the ability to gather molecule-bound information and transform it into a behavioral response. The flexibility and versatility in the beetles' ability to detect pheromones and host odors is concluded to be

due to its antennal olfactory sensilla which possess varying degrees of specificity and which are present in varying numbers. In the southern pine beetle acceptors for the chemical frontalin which will also accommodate an array of other compounds were found. It was suggested that a mixture of compounds could be used for pine beetle control which would block response to frontalin and thereby interrupt the aggregation phase of behavior in host tree attack. Evaluations are being made of endo-brevicom and verbenone for this use. The compounds have been found to reduce numbers of attacking beetles, although they do not prevent attack on trees in an active infestation. It is concluded that more behavioral and physiological information on the olfactory perception of bark beetle species is needed for the development of pheromones and host orders in pest management.

80-0628. Parochetti, J. V.; Harris, T. C. (Maryland Agric. Exp. Stn., Dep. Agron., College Park, MD) **Bifenox alone and with selected herbicides applied incorporated versus preemergence for soybean weed control.** *Proc. Northeast. Weed Sci. Soc.* 33: 11-16; 1979 (4 references).

The effects of incorporation, rate, and herbicide combination on soybean injury and weed control were studied from 1976-78. Bifenox was applied alone and in combination with alachlor, trifluralin, and pendimethalin. Soybean leaf burn and shoot stunting occurred at all preemergence applications. Incorporation of the chemicals at 2.5 or 5.0-7.5 cm eliminated soybean injury. Crop yields were significantly increased over controls by the incorporation of bifenox.

80-0629. Devlin, R. M.; Kisiel, M. J.; Kostusiak, A. S. (Lab. Exp. Biol., Cranberry Exp. Stn., East Wareham, MA 02538) **The blocking of carotenoid synthesis in corn with the experimental herbicide R-40244.** *Proc. Northeast. Weed Sci. Soc.* 33: 95-99; 1979 (10 references).

Corn seeds were immersed for 6 hr in solutions of R-40244 at concentrations of 3.2, 32, 320, and 1600 μM (w/v). Seedlings treated with 3.2 μM dose levels did not show a drop in chlorophyll content. Chlorotic development could be noted, however, soon after the shoot emerged from the seeds which had been treated at the 32 μM dose level. A 5% decrease in chlorophyll content was noted in these seeds. The highest level of R-40244 tested caused an 81% drop in chlorophyll content. A concomitant loss in carotenoid content was noted. R-40244 also inhibited the length of the shoots, causing an 18% inhibition in length at the highest dose tested. Root growth was not affected.

80-0630. Regehr, D. L.; Pizzolato, T. D. (Dep. Plant Sci., Univ. Delaware, Newark, DE 19711) **Anatomical aspects of 2,4-DB tolerance in soybean.** *Proc. Northeast. Weed Sci. Soc.* 33: 100; 1979.

Soybean plants were overhead sprayed with an aqueous solution of a dimethyl amine salt of 2,4-DB at a concentration of 0.56 kg acid eq/ha. Spraying was done 27 days after planting. By the 15th day after spraying the cross-sectional area of the cortex was increased 3-fold. No changes were noted in the xylem and pith. Total phloem cross-sectional area was greatly increased. Cell division and enlargement were encouraged to such a degree that the conducting phloem of the metaphloem and early secondary phloem was obliterated; the life of the conducting phloem cells was shortened. Phloem obliteration was compensated for by the accelerated differentiation of secondary conducting phloem in 2,4-DB treated plants. It was concluded that this enhanced differentiation seems to aid in the resistance to 2,4-DB in legumes. They do not have this degree of resistance to 2,4-D.

80-0631. Davis, C.; Harvey, R. G. (Agron. Dep., Cornell Univ., Ithaca, NY 14853) **Reversal of glyphosate toxicity to alfalfa calli by phenylalanine and tyrosine.** *Proc. Northeast. Weed Sci. Soc.* 33: 112-113; 1979.

Alfalfa callus was grown on media to which amino acids had been added after the media had been autoclaved and partially cooled. It had previously been demonstrated that 1 mM glyphosate was sufficient to inhibit alfalfa growth. The amino acid treatment caused a reversal of glyphosate toxicity. The fact that the reversal was incomplete may be explained by the presence of 3 isozymes of chlorismate mutase with different activation energies, 2 of which were affected by phenylalanine and tyrosine.

80-0632. Selleck, G. W. (Cornell Univ., L. I. Hortic. Res. Lab., Riverhead, NY) **Biological control of hedge bindweeds on Long Island.** *Proc. Northeast. Weed Sci. Soc.* 33: 114-118; 1979 (4 references).

The Argus Tortoise Beetle (*Chelymorpha cassidea*) was successfully used to clean fields of bindweed within 10 days after release of the insect. The beetles were used on fields growing corn, zucchini, rye, pine, grape, *Rhododendron, Euomymus* and *Pachysandra.* The fact that the insect fed only on the plants on the Convolvuaceae family indicates its extreme usefulness for controlling plants such as morning glory and bindweed for areas of crops where insecticides are not a desirable means of achieving control.

80-0633. Edgerton, L. J. (Dep. Pomol., Cornell Univ., Ithaca, NY 14853) **Effect of some growth regulators on shoot elongation and branching of apple.** *Proc. Northeast. Weed Sci. Soc.* 33: 150-153; 1979 (10 references).

Apple seedlings were treated with the growth regulators M&B 25105, RH-6201, ABG-3001, and daminozide. Seedlings were sprayed with thorough

coverage of leaf and stem surfaces to the point of run-off. RH-6201 was applied at concentrations of 250, 1000, 1500 and 2000 ppm, in combination with ABG-3001, and in combination with ABG-3001 + daminozide. M&B 25105 was applied at concentrations of 250, 1000, 1500, and 2000 ppm, and in combination with ABG-3001. ABG-3001 was applied at concentrations of 150, 250, and 500 ppm, and in combination with daminozide. Daminozide alone was applied at a concentration of 1500 ppm. In promoting lateral growth during the period of interrupted shoot elongation, M&B 25105 was more effective than RH-6201. Both compounds caused more leaf abnormalities and/or phytotoxicity than did ABG-3001. Combinations of M&B 25105, RH-6201, and ABG-3001 increased lateral formation, but were not superior in results to ABG-3001 used alone. The addition of daminozide to the M&B 25105-RH-6201 combination reduced shoot growth and increased the number of laterals produced, but resulted in considerable phytotoxicity.

80-0634. Beste, C. E. (Dep. Hortic., Univ. Maryland, College Park, MD 20742) **Herbicide evaluations for cucumbers.** *Proc. Northeast. Weed Sci. Soc.* 33: 157; 1979.

Various herbicides were evaluated for effectiveness in control of weeds in cucumber crops, and for toxicity to cucumbers. Acceptable tolerance and weed control was achieved with butralin at a concentration of 0.5 lb/A (0.57 kg/ha). At higher concentrations butralin caused a reduction in vigor in cucumbers. Acceptable weed control and tolerance were achieved with oryzalin at 0.375 lb/A (0.42 kg/ha) levels. Slight phytotoxicity to cucumber occurred at 0.5 lb/A oryzalin, and at higher concentrations a loss of vigor was noted. Ethalfluralin at 0.75 lb/A (0.85 kg/ha) gave acceptable weed control, and was not toxic to cucumbers. Chloramben methyl ester was safe for use at up to 3.0 lb/A (3.39 kg/ha), but did not provide acceptable weed control. DCPA caused cucumber vigor and yield reductions. Excellent safe grass control with marginal purslane control was achieved with diclofop methyl + chloramben methyl ester at concentrations of 1.0 and 2.0 lb/A (1.13 and 2.26 kg/ha). Nitrofen was tolerated at 3.0 lb/A. Napropamide caused severe cucumber injury at 1.0 lb/A.

80-0635. Senesac, A. F.; Warholic, D. T.; Sweet, R. D. (Dep. Veg. Crops, Cornell Univ., Ithaca, NY 14853) **Tolerance of snap and dry bean varieties to bentazon, metolachlor and pendimethalin.** *Proc. Northeast. Weed Sci. Soc.* 33: 178-182; 1979 (4 references).

No injury or yield losses were sustained by 4 varieties of snap beans (2 green and 2 wax) treated with 0.75 or 1.0 lb/A (0.85 or 1.13 kg/ha) of pendamethalin preplant incorporated. Burning of foliage was caused by split applications of bentazon (0.5 + 0.5 or 1.0 + 1.0 lb/A; 0.57 + 0.57 or 1.13 + 1.13 kg/ha) applied at the unifoliate stage and at the trifoliate stage. Significant losses in yield were also noted. Metolachlor preplant incorporated, preemergence, or emergence applications at 2 lb/A (2.26 kg/ha) concentrations caused no loss in yields from 3 dry bean varieties. Bentazon treatment at the 2 lb/A level did cause leaf scorching, but no loss of yield.

80-0636. Bing, A.; Corell, T. (Long Island Hortic. Res. Lab., Riverhead, NY) **The use of tebuthiuron near trees.** *Proc. Northeast. Weed Sci. Soc.* 33: 232; 1979.

Possible effects on nearby trees due to the application of tebuthiuron, a soil sterilant, were investigated. The chemical was applied around the base of a tree and to 5 x 15 ft areas, 5-10 ft, 10-15 ft, and 15-20 ft, from the base of trees at the rate of 10 lb/A (11.30 kg/ha). Complete defoliation resulted, with some new leaves starting where the basal spray had been used. Other trees showed no injury from the chemical. The treated areas were devoid of vegetation.

80-0637. Greager, R. A. (NER, ARS, SEA, USDA, Frederick, MD 21701) **Evaluation of herbicides on six species of container-grown woody ornamentals.** *Proc. Northeast. Weed Sci. Soc.* 33: 238-239; 1979.

Six species of container-grown nursery stock (bearberry cottoneaster, wintercreeper euonymus, boxleaf Japanese holly, Andorra juniper, glossy privet, and Wyatti pyracantha) were planted and sprayed with oryzalin (75% WP formulation). Other herbicides were applied to the soil as granular formulations (G) and included napropamide (10%), alachlor (15%), and oxadiazon (2 and 5%). Monthly evaluation of the effects of the herbicides on weeds and phytotoxicity to nursery stock was conducted. Weed control was rated on a scale of 0-10 (no control, total control). Phytotoxicity was also rated on a scale of 0-10 (0-3, no reduction or limited injury; 3-9, undesirable injury; 10, kill). The best chemicals for control of weeds without damage to the plants during a 4 mo period were found to be oxadiazon 2%, followed by oxadiazon 5% and oryzalin. Napropamide was not significantly different from control plants in weed control. Alachlor provided weed control for 1 mo, after which no control was noted. Phytotoxicity did not exceed the 0-3 rating after 4 mo for any treatment. A summary of the number of months of 75% weed control for 6 nursery stock species is included in tabular form.

80-0638. Hilen, A. G.; Bing, A.; Good, G. L. (Dep. Hortic. & Ornamental Hortic., Cornell Univ., Ithaca, NY 14853) **Glyphosate injury as the result of preplant treatment.** *Proc. Northeast. Weed Sci. Soc.* 33: 245-259; 1979.

Phytotoxicity to woody plants, caused by preplant

application of glyphosate for quackgrass control, was evaluated and characterized. Several laboratory and field experiments were conducted using viburnum, privet, yew, forsythia, plum, cherry, and apple as test plants. Various application procedures were evaluated, with glyphosate applied at rates of 0, 1.12, 2.24, 4.49, 8.98, 16.83, and 33.66 kg AI/ha. In all tests root induced toxicity was sporadic and infrequent. The interaction of factors such as plant species, state of active growth, soil, rate of application, and time interval between application and tillage was found to be significant in the production and symptomology of glyphosate injury.

80-0639. Bing, A. (Long Island Hortic. Res. Lab., Riverhead, NY 11901) **The effect of preemergence postplant treatments of alachlor, napropamide, oxadiazon, oxyfluorfen and prodiamine on gladiolus.** *Proc. Northeast. Weed Sci. Soc.* 33: 264-269; 1979 (3 references).

Napropamide [2, 4, 8, and 16 lb/A (2.26, 4.52, 9.04, and 18.08 kg/ha, respectively)], prodiamine (2 and 4 lb/A), oxadiazon (4 and 8 lb/A), oxyfluorofen (2 and 4 lb/A) and alachlor (4 and 8 lb/A) were tested for phytotoxic effects and weed control effectiveness in gladiolus varieties. The herbicides were applied pre-emergence on May 31, 10-20 days after planting. Leaf injury was determined at 14 days after application, weed control at 48 days, and cut flower and corm yields in August-September. Napropamide and prodiamine were classified as nonphytotoxic at all levels tested. Oxadiazon and oxyfluorfen caused leaf burn and greatly reduced corm yield at the concentrations used. Alachlor reduced both cut flower yield and corm production at both application rates. Results from manually weeded plots (handweeded during May-September) were the same as control plots.

80-0640. Sanok, W. J.; Selleck, G. W.; Creighton, J. F.* (Long Island Hortic. Res. Lab., Riverhead, NY) **Weed control and phytotoxicity with herbicides in five tomato varieties.** *Proc. Northeast. Weed Sci. Soc.* 33: 332-335; 1979 (2 references).

Tomatoes (Jet Star, Red Pak, Ramapo, Early Girl, and Better Boy) were transplanted to a field on May 30. The field had been treated on May 29 with various herbicides in preemergence control measures. Such treatments with napropamide, metribuzin, trifluralin, or diphenamid achieved control of barnyardgrass and purslane by June 15. By mid-June postemergence treatments of metribuzin were needed to control both of these species. The addition of metribuzin postemergence effectively controlled weeds, but was visibly phytotoxic to the Jet Star, Red Pak, and Ramapo varieties. Napropamide may also have slightly depressed the early yield of Ramapo. It was suggested that metribuzin rates above 0.28 kg/ha may cause injury to a number of tomato varieties.

80-0641. Monji, N.; Castro, A.* (Dep. Pathol., Univ. Miami Sch. Med., Miami, FL 33101) **Plasma nicotine pharmacokinetics in dogs after intravenous administration: determination by radioimmunoassay.** *Res. Commun. Chem. Pathol. Pharmacol.* 23(2): 267-276; 1979 (11 references).

Female mixed-breed dogs were used to study plasma nicotine pharmacokinetics after an iv injection of 100 μg/kg S-nicotine. Blood samples were collected 5, 10, 15, 30, 60, 120 and 180 min after treatment, centrifuged, and the plasma nicotine levels determined by radioimmunoassay. Plasma nicotine levels declined rapidly following the injection, were retained for 30 min, then decreased monoexponentially. The biological half-life was calculated to be 0.61 hr, similar to that in man and one-half that in the rat. The total body clearance and apparent volume of distribution in dogs were about one-fifth of that in rats. It is suggested that the dog may be a better experimental animal than the rat in studying pharmacokinetic parameters for nicotine.

80-0642. Merezhinskii, Yu. G.; Sosnovaia, O. N.; Semenov, A. G.; Dudinets, S. M. (Author address not given) **Gerbitsidy i kachestro korneplodov. [Herbicides and the quality of root crops.]** *Sakh. Svekla* 2: 19-20; 1979 (Russian).

The effects of Pyramin (chloridazon) (4 kg/ha), Pyramin + TCA (6 kg/ha), Betanal (phenmedipham), TCA, and Betanal + TCA on the crop yield and on the basic qualitative parameters of sugar beets were studied. The herbicides were applied together with N-P-K fertilizers before sowing or as postemergence treatment. The herbicides caused an increase in the crop yield due to weed control without affecting the sugar content. The ash content decreased somewhat from 2.86% in the controls to 2.26-2.39% in the beets treated with Pyramin and Pyramin + TCA, but there were no substantial changes in the beets treated with Betanal, TCA or their combination. The pectin content decreased from 5.51-5.54% in the controls to 3.61-5.1%, and there was no substantial change in the nitrogen content.

80-0643. Satarov, V. A. (Kursk Inst. Agric., Kursk, USSR) **Effektivnye smesi gerbitsidov v Kurskoy oblasti. [Effectiveness of herbicide mixtures in Krusk oblast.]** *Sakh. Svekla* 2: 21-23; 1979 (Russian).

The effectiveness of Eptam (EPTC; 3-4 kg/ha before sowing), Betanal (phenmedipham; 1.18 kg/ha), and Betanal (1.18 kg/ha) + Eptam (3 kg/ha) in sugar beet fields was studied. The sugar content of the beets was 16.7% in the controls without mechanical weeding, 16.5% in the controls with mechanical weeding, 16.3% in the fields treated with Eptam, 16.4% in the fields treated with Betanal, and 17.3% in the fields treated with Eptam + Betanal. The findings indicate that the herbicides caused no significant change in the sugar content of the beets.

80-0644. Gonik, G. E.; Tkachenko, A. I. (North. Caucasian Branch, All-Union Agric. Res. Inst., Krasnodar, USSR) **Effektivnye smesi gerbitsidov na Severnom Kavkaze. [Effectiveness of herbicide mixtures in Northern Caucasus.]** *Sakh. Svekla* 2: 23-24; 1979 (Russian).

The effects of various herbicides and their mixtures in sugar beet fields were studied. The herbicides used were sodium trichloroacetate (TCA; 7.5-12.5 kg/ha), TCA (7.5 kg/ha) + lenacil (1 kg/ha), TCA (10 kg/ha) + lenacil (1 kg/ha), lenacil (1-1.5 kg/ha), TCA (10 kg/ha) + lenacil (1.5 kg/ha), TCA (7.5 kg/ha) + lenacil (2 kg/ha), TCA (7.5 kg/ha) + ronit (cycloate; 4 kg/ha), and ronit (6 kg/ha). The herbicide treatment caused no significant changes in the sugar content of the beets (13.9-14.2% in the controls versus 13.7-14.6% in the treated beets).

80-0645. Shimanskii, L. K.; Slobodianik, V. K.; Serba, A. E. (Uladovo-Liulinetsk Exp. Sel. Stn., Uladovo-Liulinetsk, USSR) **Smesi gerbitsidov protiv sorniakov. [Mixtures of herbicides for control of weeds.]** *Sakh. Svekla* 3: 37-38; 1979 (Russian).

The herbicidal effectiveness of 5 different herbicide mixtures in sugar beet and the effects of the herbicide mixtures on the basic qualitative characteristics of the crop were studied. The herbicide mixtures used were ronit (cycloate; 4 kg/ha) + Pyramin (chloridazon; 4 kg/ha), ronit + Pyramin + Eptam (EPTC; 4 kg/ha), TCA (6 kg/ha) + lenacil (1 kg/ha), TCA + lenacil + Eptam, and TCA + lenacil before sowing + treflan (trifluralin; 0.6 kg/ha) for postemergence treatment. The treatment caused no significant change in the sugar content of the beets (17.1% in the controls and 16.9-17.2% in the treated fields without manual weeding, and 16.8-17.3% in the fields with additional manual weeding).

80-0646. Prentis, S. (Author address not given.) **Agriculture and pollution - a growing problem.** *Trends Biochem. Sci.* 4(12): N298-N299; 1979.

A summary is presented of a report on the problems of agriculture and pollution, which was prepared by the United Kingdom Royal Commission on Environmental Pollution. The Commission recommends that the use of pesticides at the minimal level consistent with efficient food production should become declared policy in the U.K. Among the disadvantages of using pesticides are increased pollution of the environment and the appearance of resistant strains of the pests. The Commission recommends the development of more resistant strains by the plant breeders and the development of biological controls. The use of nitrogenous fertilizers and the effect of pollution on agriculture are also discussed.

80-0647. Brown, R. J. (Author address not given) **Ecology of insecticide water pollution.** *US NTIS PS Rep.* PS-790,109: 64 pg.; 1979 (56 references).

This volume contains 56 abstracts on insecticides in the water environment, including lakes, rivers, oceans, estuaries, streams and ground water. The topics cover the effects upon plants, animals, and humans. Chemical deterioration in soils and water, sources, modeling, pollution by, and accumulation as it occurs in soils, plants and animals are described. Abstracts of items from this volume appear in the appropriate sections of this issue of *Pesticides Abstracts.* (Author abstract by permission)

80-0648. Duke, T. W. (Environ. Res. Lab., Gulf Breeze, FL) **American-Soviet symposium on the biological effects of pollution on marine organisms (1st).** *US NTIS PS Rep.* PS-790,109 pg. 5; 1979.

This symposium was conducted under a US-USSR Environmental Agreement, Project 02.06-21 titled *Influence of Pollutants on Marine Organisms.* American and Soviet specialists discuss state-of-the-art for hydrobiological analysis of basic structural components of marine ecosystems and the influence of various pollutants on these components. Participants define problems related to methods for modeling the influence of pollutants on the marine environment, long-term forecasting and determination of permissible loads of pollutants, and the unification an intercalibration of methods for determining production of micro-organisms of ocean bacterioplankton and phytoplankton. Results or laboratory research on the influence of pollution on the marine environment are presented. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0649. Anonymous (NRC, Washington, DC) **Kepone/mirex/hexachloro cyclopentadiene: an environmental assessment.** *US NTIS PS Rep.* PS-790,109 pg. 18; 1979.

This report's assessment of the scientific and technical knowledge about the effects of Kepone (chlordecone), mirex, and hexachloro cyclopentadiene as environmental pollutants is based primarily on 2 literature surveys prepared for EPA's Office of Research and Development by Battelle Columbus Laboratories and the Stanford Research Institute. The principal findings and research needs arising from the Panel's assessment are summarized. Documentation for the findings can be found in the body of the report as noted parenthetically after each finding. The list of research needs identifies areas where more knowledge is needed before a truly comprehensive assessment of the effects of Kepone, mirex, and hexachloro cyclopentadiene can be made. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0650. Mel'nikov, N. N.; Mastriukova, T. A. (Author address not given) **Kongress po khimii pestitsidov.**

[Congress on pesticide chemistry.] *Vestn. Akad. Nauk SSSR* (8): 80-83; 1979 (Russian).

The results of the Fourth International Congress on Pesticide Chemistry held in Zurich, July 24-28, 1978 are summarized. Problems discussed at the Congress include synthesis of pesticides; chemical structures and biological properties of organic pesticides; and pesticide formulations. Pesticidal activity of natural compounds such as regulators of growth and development of plants and insects; biochemistry of pests and mechanisms of pesticide action; degradation of pesticides in the environment; and pesticide residues and methods of their determination were also reviewed.

80-0651. King, M. G.; Radosevich, S. R. (Dep. Bot., Univ. California, Davis, CA 95616) **Tanoak (*Lithocarpus densiflorus*) leaf surface characteristics and absorption of triclopyr.** *Weed Sci.* 27(6): 599-604; 1979 (36 references).

Absorption of triclopyr [[(3,5,6- trichloro-2-pyridinyl) oxy] acetic acid] by tanoak [*Lithocarpus densiflorus* (Hook. & Arn.) Rehd.] leaves was investigated. Greater amounts of ^{14}C-triclopyr were absorbed by immature leaves than mature leaves and by abaxial than adaxial surfaces. Both surfaces of immature and mature tanoak leaves were characterized. Stomata were present only on the abaxial surface and were more numerous on immature leaves than mature leaves. Immature leaves had less epicuticular wax and thinner, more permeable cuticular membranes than mature leaves. Stellate trichlome densities were greater on abaxial surfaces than adaxial surfaces and on immature than mature leaves. Absorption of ^{14}C-triclopyr was influenced by each of the leaf surface features studied. (Author abstract by permission)

80-0652. Hamilton, K. C.; Arle, H. F. (Arizona Agric. Exp. Stn., Tucson, AZ 85721) **Response of cotton (*Gossypium hirsutum*) to dicamba.** *Weed Sci.* 27(6): 604-607; 1979 (11 references).

Single over-the-top and directed applications of dicamba (3,6-dichloro- *o*-anisic acid) were made to cotton (*Gossypium hirsutum* L. Deltapine 16). Dicamba applied over-the-top of cotton caused foliage malformation for about 6 wk. Dicamba (32 g/ha) applied to cotton foliage 3-15 wk after emergence reduced average cotton yields. Applications of 16-64 g/ha of dicamba over-the-top of cotton before bloom had less effect on cotton foliage, yield, boll components, and fiber properties than application at bloom. Directed applications of dicamba to the soil or to the base of cotton and soil caused foliage malformation but did not affect cotton yield, boll components, and fiber properties. (Author abstract by permission)

80-0653. Pillai, P.; Davis, D. E.; Truelove, B. (Dep. Bot. & Microbiol., Agric. Stn., Arburn Univ., Auburn, AL 36830) **Effects of metolachlor on germination, growth, leucine uptake, and protein synthesis.** *Weed Sci.* 27(6): 634-637; 1979 (16 references).

The effect of metolachlor [2-chloro- *N*- (2-ethyl- 6-methyl- phenyl)- *N*- (2-methoxy- 1- methylethyl) acetamide] on the germination and growth of 14 plant species was investigated. A 10^{-3} *M* concentration of the herbicide did not reduce germination as much as 10% for corn (*Zea mays* L. Pioneer 3369A), English pea (*Pisum sativum* L. Thomas Laxton), sicklepod (*Cassia obtusifolia* L.), or wheat (*Triticum aestivum* L. Coker 68-15) but reduced germination of oat (*Avena sativa* L. Coker 227) to 0, lettuce (*Lactuca sativa* L. Grand Rapids) to 11%, and peanut (*Arachis hypogea* L. Florunner) to 14%. A 10^{-6} *M* concentration did not affect the germination of any species tested. A 10^{-5} *M* concentration did not significantly decrease length or fresh weight of corn, morningglory, or wheat roots but had at least some adverse effect on all other species tested. At this concentration root length was less than 66% of the control for English pea, cucumber (*Cucumis sativus* L. Ashley), radish (*Raphanus sativus* L. Scarlet Globe), sicklepot, and soybean [*Glycine max* (L.) Merr. Ransom]. Metolachlor was supplied to germinating seeds of barley (*Hordeum vulgare* L. Barsoy), English pea, and corn either only in the shoot, seed, or root zone, or to all parts. One kg/ha applied in the shoot zone of barley and corn significantly reduced seedling height and dry weight but had no effect when applied in either the seed or root zone. Application in all zones was approximately twice as detrimental as when applied in only the shoot zone. Application of 4 kg/ha in only the shoot, seed, or root zones of English pea did not decrease seedling height or dry weight but application in all zones decreased these values about 98%. A 10^{-5} *M* concentration of metolachlor decreased leucine uptake by cucumber root tips but not its incorporation into protein. A 10^{-4} *M* concentration strongly reduced leucine uptake and slightly decreased leucine incorporation into protein. (Author abstract by permission)

80-0654. McWhorter, C. G. (South. Weed Sci. Lab., Sci. Ed. Admin., ARS USDA, Stoneville, MS 38776) **The effect of surfactant and environment on the toxicity of metriflufen to soybean (*Glycine max*) and johnsongrass (*Sorghum halepense*).** *Weed Sci.* 27(6): 675-679; 1979 (11 references).

Metriflufen[-12-[4-(4-trifluoro methylphenoxy) phenoxy] propanoic acid] was applied as the methyl ester at 0.28 and 0.56 kg/ha over-the-top to johnsongrass [*Sorghum halepense* (L.) Pers.] growing from rhizomes and to soybeans [*Glycine max* (L.) Merr. Lee 68]. After herbicide treatment, plants were grown in the growth chamber for 14 days at 16, 24, or 32°C with relative humidity (RH) at 40 or 100% at each air temperature. Johnsongrass was not controlled at 16°C regardless of metriflufen rate, RH, or the addition on nonoxynol [α-(*p*-nonyl phenyl)- ω-hydroxypoly (oxyethylene)] (with 9.5 moles of polyoxyethene) surfactant at 0.25 (g/100 ml) to spray solutions. Johnsongrass control at

24°C varied from 5 to 98%, with significantly better control at 100% than at 40% RH. The presence of surfactant increased johnsongrass control at 24°C and 40% RH but not at 24°C and 100% RH. Johnsongrass control at 32°C varied from 48 to 98%, and it was increased by the presence of the surfactant, regardless of metriflufen rate or RH level. At 16°C metriflufen was more injurious to soybeans than to johnsongrass, but at 24 and 32°C johnsongrass control was significantly greater than soybean injury. The presence of surfactant in spray solutions generally did not increase soybean injury, regardless of temperature or RH level. These results suggest that metriflufen is most selective in controlling johnsongrass in soybeans at 24°C, especially under high RH. (Author abstract by permission)

80-0655. Schreiber, M. M.; Warren, G. F.; Orwick, P. L. (Sci. Ed. Admin., ARS, USDA, West Lafayette, IN 47907) **Effects of wetting agent, stage of growth, and species on the selectivity of diclofop.** *Weed Sci.* 27(6): 679-683; 1979 (13 references).

A 2-yr field study was conducted to determine whether the addition of wetting agents to diclofop [2- [4-(2,4- dichloro phenoxy) phenoxy] propanoic acid] could enhance its postemergence control of grass weeds without altering its crop tolerance. In each year, 12 species were treated at two stages of growth with at least two concentrations of diclofop. Regardless of the treatment, selectivity was not altered on wheat (*Triticum aestivum* L.), soybeans [*Glycine max* (L.) Merr.], cucumber (*Cucumis sativus* L.), or sorghum [*Sorghum bicolor* (L.) Moench]. The addition of wetting agent to diclofop was of no value on highly susceptible grass weed species such as barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] or on the more resistant species such as large crabgrass [*Digitaria sanguinalis* (L.) Scop.]. Only on an intermediately susceptible species such as giant foxtail (*Seteria faberi* Herrm.) could any significant differences in control be attributed to a wetting agent. The stage of growth of the grass weed species at time of treatment and the diclofop concentration were more important than the presence of a nonionic wetting agent. (Author abstract by permission)

80-0656. Richard, E. P.; Goss, J. R.; Arntzen, C. J. (Delta Branch, Mississippi Agric. & Forest Exp. Stn., Stoneville, MS 38776) **Glyphosate does not inhibit photosynthetic electron transport and phosphorylation in pea (*Pisum sativum*) chloroplasts.** *Weed Sci.* 27(6): 684-688; 1979 (29 references).

The activity of glyphosate [*n*- (phosphonomethyl) glycine], formulated as the isopropylamine salt, on *in vitro* photosynthesis was investigated. When pH 4.7 glyphosphate solutions were titrated to a pH equal to that of the reaction media (pH 7.8), glyphosate additions had no effect on whole chain electron transport between coupled photosystem II (PS II) and photosystem I (PS 1) in stoma-free chloroplast thylakoids from peas (*Pisum sativum* L. Morse's Progress No. 9). Inhibition did not occur even after a 2 hr dark incubation of lamellae in a 5 m*M* solution of glyphosate. Fluorescence studies failed to detect an effect of glyphosate on PS-II mediated electron transport processes or upon light harvesting properties of PS II even after a 2 hr glyphosate/chloroplast preincubation. Glyphosate had no effect on cyclic and noncyclic photophosphorylation even after a 100 min dark incubation of chloroplast membranes in a 5 m*M* solution of glyphosate. Based on these assays is concluded that glyphosate has no direct effect on the photochemical reactions of photosynthesis when the pH of the active compound is adjusted to that of the reaction mixture prior to addition to a chloroplast suspension. (Author abstract by permission)

80-0657. Hirschberger, M. (Bayer Landesinst. Arbeitsmed., D-8000 Munich 22, BRD) **Pentachlorphenolvergiftung? [Pentachlorophenol poisoning.]** *ZFA (Stuttgart)* 55(25): 1376; 1979 (2 references) (German).

In a letter to the editor the case of a young man with autonomic disorders and normocalcemic tetany is presented. The patient had handled paints allegedly containing pentachlorophenol (PCP), and the possibility of the symptoms being linked to pentachlorophenol poisoning was questioned. In response the editor states that chronic poisoning by pentachlorophenol causes headache, excessive perspiration, abdominal pains, loss of appetite, increases in basal metabolism, increased body temperature, lactic acid and acetone levels in the blood, cyanosis, tachycardia, hypotension, and increased respiration rate. Pancytopenia, hemolytic anemia, neutropenia, and eosinophilia are seen rarely. The responsibility involvement of occupational exposure to pentachlorophenol in producing the reported symptoms could be ascertained only by detailed investigations. Tetany as a consequence of poisoning by this substance has never been reported. The MAC of pentachlorophenol is 0.05 ppm.

80-0658. Spiridonov, Yu. Ya.; Makeeva-Gur'ianova, L. T.; Shestakov, V. G.; Shabanov, A. K.; Bondarev, V. S. (All-Union Res. Inst. Phytopathol., Moscow, USSR) **Osnovnye kineticheskie kharakteristiki summarnogo protsessa razlozheniya piklorama v pochve. [Major kinetic characteristics of a total process of degradation of picloram in soil.]** *Agrokhimiya* (8): 112-116; 1979 (Russian).

An attempt was made to determine the major kinetic characteristics of degradation of the herbicide picloram in soil. Using the data on the rate of degradation of picloram in soddy-podzol soil at a constant humidity of 60%, and 5, 22 and 35°C, the value of the constant of degradation rate, and the energy of activation of the process of degradation were calculated. The low value of the energy of activation (5.5 kcal/g-mol) can be explained by the marked catalysis of picloram degradation due to the activities of biocatalysts.

80-0659. Pemberton, J. M. (Dep. Microbiol., Univ. Queensland, St. Lucia 4067, Australia) **Pesticide degrading plasmids: A biological answer to environmental pollution by phenoxy herbicides.** *Ambio* 8(5): 202-205; 1979 (14 references).

Basic biological mechanisms involved in the evolution and spread of pesticide-degrading ability through soil microbial populations are reviewed. Particular emphasis is given to the genetics and molecular biology of 2,4-D plasmids which play an important role in these degradation processes. Such knowledge may allow the production of soil microbial populations which carry plasmids conferring the ability to degrade recalcitrant pesticide molecules such as 2,4,5-T and the potent contaminant it contains, TCDD.

80-0660. Edgren, M.; Olsson, M. (Res. Lab., Natl. Swedish Environ. Prot. Board, S-17011 Drottningholm, Sweden) **Preliminary results on uptake and elimination at different temperatures of *p,p'*-DDT and two chlorobiphenyls in perch from brackish water.** *Ambio* 8(6): 270-272; 1979 (23 references).

Perch (*Perca fluviatilis*) were exposed to *p,p'*-DDT and 2 chlorobiphenyls at different water temperatures. The chlorobiphenyls used were 2,3',4',5- tetrachlorobiphenyl and 2,2', 4,4', 5,5'- hexachlorobiphenyl. Concentrations of chlorinated hydrocarbons accumulated by fish maintained at 15°C were found to be double the amount in fish kept at 5°C. Elimination rates of chlorinated hydrocarbons were found to be independent of temperature. The 3 organochlorines studied did, however, show different elimination rates.

80-0661. Fuchs, A.; de Vries, F. W. (Lab. Phytopathol., Agric. Univ., Wageningen, The Netherlands) **Bacterial breakdown of benomyl. I. Pure cultures.** *Antonie van Leeuwenhoek J. Microbiol. Serol.* 44: 283-292; 1978 (34 references).

Benomyl and thiabendazole were used as selective agents to isolate *Pseudomonas* strains in mineral medium with benomyl as the source of carbon. No growth was observed when other benzimidazole compounds were tried as the carbon source. It was shown that the actual source of the carbon in the successful cultures was n-butylamine, which originated from the butylcarbamoyl side chain. The *Pseudomonas* strains which were isolated were able to degrade MBC (methyl benzimidazol- 2-yl carbamate) to 2-amino benzimidazole (2-AB). It was suggested that the carbamic acid methyl ester side chain might be an additional source of carbon.

80-0662. Barstad, J. A. B. (Dep. Environ. Toxicol., Natl. Inst. Public Health, Oslo, Norway) **Pesticides and heavy metals as food contaminants.** *Arch. Toxicol.* (SPL1): 47-54; 1978 (8 references).

From the general pollution contaminants spread along a variety of routes, many of which lead to our food. Pesticides and heavy metals as food contaminants have raised strong public concern and contributed to the general uneasiness associated with the pollution boom of the last 2 decades. Pesticides in food are predominantly residues from their application on growing crops, less often from postharvest use on stored agricultural products, whereas heavy metals contaminate the food at various stages along the food production line. Both groups of contaminants exhibit in the number of their members a spectrum of health hazards. A few examples of these will be dealt with, and thought will be given to some features in the philosophies behind the current practices of risk assessment and management in this area. Among the pesticides considered are DDT, aldrin, chlordane, heptachlor, dieldrin, 2,4,5-T, paraquat, diquat, and 2,3,7,8- tetrachlorodibenzo-*p*-dioxin. A widespread shortage of toxicological expertise maintains a level of ignorance sufficient to make risk evaluation a dilemma. This distressing shortcoming at least partly arises from a common neglect of toxicology as a universal discipline. Some international effects to control food contamination will also be touched upon. (Author abstract by permission)

80-0663. Singh, G.; Rippon, L. E.; Gilbert, W. S.; Ahmad, N. (Dep. Agric., Rydalmere, New South Wales) **Sec-butylamine residues in citrus, pome fruits and bananas from post-harvest treatments.** *Aust. J. Exp. Agric. Anim. Husb.* 19(96): 118-121; 1979 (18 references).

Post-harvest citrus and pome fruits were treated with 0.5 or 1.0% *sec*-butylamine (2-aminobutane) by bulk dipping or by flooding. The fruits were analyzed for residue contents by gas chromatography. Residues in citrus fruits ranged from 0.88-7.65 μg/g. Residues were lowest in

flooded oranges and highest in bulk-dipped mandarins and lemons. In general, the single bulk dip method resulted in 2-3 times higher residue levels than flooding. Pome fruit residues ranged from 2.75-11.6 μg/g. Jonathan apples had the lowest residue levels, while pears contained 3-4 times higher amounts.

80-0664. Martinez Viera, R.; Pagel, H. (Inst. Invest. Fundam. Agric. Trop. Alejandro de Humboldt, Santiago de las Vegas, Cuba) **Untersuchungen ueber den Einfluss von Atrazin und Simazin auf die N-bindenden Bakterien *Azotobacter* und *Beijerinckia* in ferrallitischen Boeden Kubas. [Studies of the effect of atrazine and simazine on nitrogen-binding bacteria *Azotobacter* and *Beijerinckia* in ferrallitic soils of Cuba.]** *Beitr. Trop. Landwirtsch. Veterinaermed.* 16(2): 137-144; 1978 (10 references) (German).

The effects of different doses of atrazine and simazine (4, 8, and 16 kg/ha) on *Azotobacter* and *Beijerinckia* were studied in weakly ferrallitic soils at 2 sites in Cuba (Santiago de las Vegas and Jovellanos) during the dry and rainy seasons. *Beijerinckia* and *Azotobacter* were stimulated by both herbicides for up to 7 days, partly also up to 15 days, after application. Atrazine exhibited a stronger and more lasting stimulating effect than simazine, and *Azotobacter* was affected more strongly than *Beijerinckia.* The stimulating effect was stronger and more lasting during the dry season than during the rainy season, probably due to the more rapid degradation and/or migration of the herbicides in the soil during the rainy season. The stimulating effect of the herbicides is probably due to the inhibition of the microorganisms *Bacillus cereus, B. mycoides, B. subtilis, Aspergillus flavus, Penicillium* sp. (I), *Trichosporium* sp., *Actinomyces antibioticus, A. albus, A. griseus, A. longisporus, A. ruber,* and *A. inomyces* sp. which are antagonistic to the N-binding bacteria.

80-0665. Maruszewska, M.; Gertig, H. (Food Sci. Inst., Inst. Biol. Pharmaceut. Med. Acad., 61-878 Poznan, Poland) **Przebieg rozkladu karbarylu w zawiesinach modelowych zawierajacych substancje wzorowa. [A course of carbaryl decomposition in model suspension containing a standard.]** *Bromatol. Chem. Toksykol.* 12(1): 91-93; 1979 (3 references) (Polish).

The effects of various factors on the rate of degradation of carbaryl were studied in model experiments with a commercial-grade preparation and a standard (suspension form). The rate of decomposition was most strongly affected by temperature in the range of 4-37°C. The pH value (5-10) had a stronger effect on the decomposition of the standard than on the commercial preparation.

80-0666. Miyazaki, T.; Akiyama, K.; Kaneko, S.; Horii, S.; Yamagishi, T. (Tokyo Metrop. Res. Lab. Public Health, Shinjuku-ku, Tokyo 160, Japan) **Identification of chlordanes and related compounds in goby-fish from Tokyo Bay.** *Bull. Environ. Contam. Toxicol.* 24(1): 1-8; 1980 (14 references).

Goby-fish were collected at Keihinjima along Tokyo Bay in August 1978. Residues found in fish tissues on analysis were oxychlordane, 3 ppb; *trans*-chlordane, 9 ppb, *cis*-chlordane, 6 ppb; *cis*-nonachlor, 8 ppb; *trans*-nonachlor, 18 ppb; and heptachlor epoxide, 1 ppb. Levels of total chlordane including oxychlordane were comparable with those found for *p,p'*-DDE, 29 ppb. PCB levels detected were 670 ppb. Goby-fish is a water pollution tolerant species and may be used as a sensitive indicator of environmental pollution.

80-0667. Tu, C. M. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Influence of pesticides and some of the oxidized analogues on microbial populations, nitrification and respiration activities in soil.** *Bull. Environ. Contam. Toxicol.* 24(1): 13-19; 1980 (16 references).

A loamy sand of medium texture was treated with insecticides (phorate and analogs, terbufos and analogs, triazophos, oxamyl and permethrin) at 5 μg/g of soil. Maneb and nitrapyrin were similarly applied at 100 μg/g. The fumigants Telone II (92% dichloropropene) and Telone C-17 (83% Telone II and 17% chloropicrin) were injected directly into the soil. Of the insecticides used only permethrin showed an inhibiting effect on bacterial and fungal colony counts in the soil. Terbufos sulfoxide and Telone C-17 caused a significant increase in bacterial numbers. Maneb significantly reduced microbial populations in soils. None of the chemicals suppressed the vigorous uptake of oxygen by the soils. Little evidence was found in these studies to suggest that pesticide treatments have a prolonged deleterious effect on the soil microbial activities.

80-0668. Liddle, J. A.; Needham, L. L.; Rollen, Z. J.; Roark, B. R.; Bayse, D. D. (Toxicol. Branch, Clin. Chem. Div., Bur. Lab., CDC, US Dep. HEW, Atlanta GA 30333) **Characterization of the contamination of marijuana with paraquat.** *Bull. Environ. Contam. Toxicol.* 24(1): 49-53; 1980 (4 references).

To determine the prevalence of paraquat residues in marijuana, 1006 samples from 910 seizures were analyzed for the presence of paraquat. Of the marijuana sampled 3.6% was found to be contaminated with paraquat; 33 samples out of the 910 seizures. Total wt contamination was much lower; 0.63% of the total sample wt had paraquat residues. Paraquat contamination ranged from 10-461 ppm with a mean concentration of 111 ppm and a median concentration of 52 ppm. In tests on known Mexican

grown marijuana (88 of the 910 batches) 12.5% were found to contain paraquat residues (range 10-222 ppm).

80-0669. Aten, C. F.; Bourke, J. B.; Martini, J. H.; Walton, J. C. (Dep. Chem., Hobart Coll., Geneva NY 14456) **Arsenic and lead in an orchard environment.** *Bull. Environ. Contam. Toxicol.* 24(1): 108-115; 1980 (17 references).

Samples of soil, apples, grass and vegetables were taken from an apple orchard which had been started in 1929. The orchard had been heavily sprayed up to 1965 with lead arsenate (as an agrochemical) and has retained substantial Pb and As residues. Results indicate that there is an approximate mass balance between the lead arsenate applied to the orchard and the residues found in this study. In the top 30 cm of soil, the total mass of As was 1700 lb (765 kg) and the total mass of Pb was 6000 lb (2700 kg) over background levels (~ 0 ppm for As and ~ 20 ppm at 25 cm for Pb). The estimated total application was 6900 lb (3105 kg) lead arsenate and for $PbHAsO_4$ is equivalent to 1500 lb (675 kg) arsenic and 4100 (1845 kg) lead. It is suggested that the entire application of lead arsenate is still in the surface 25 cm of soil. Arsenic was below the detection limit in apple juice and the lead concentrations were comparable to those found in commercial fresh fruits. The analysis of the vegetables indicated that the availability of old arsenic and lead in the loam soil is not high enough to be a health hazard in the apples, tomatoes, beans, cabbage, brussels sprouts, onions or potatoes grown in the field.

80-0670. Yockim, R. S.; Isensee, A. R.; Walker, E. A. (Pestic. Degradation Lab., Sci. & Educ. Adm., ARS, USDA, Beltsville, MD 20705) **Behavior of trifluralin in aquatic model ecosystems.** *Bull. Environ. Contam. Toxicol.* 24(1): 134-141; 1980 (4 references).

The first test ecosystem used was a recirculating static model and mixed (labeled and unlabeled) trifluralin was introduced by soil incorporation at field application rates of 1, 10, and 100 ppm. The amounts of trifluralin available for accumulation by the organisms depended on the rate of desorption from the soil. No toxic effects were noted on any of the life forms tested; *Daphnia, Helosoma, Oedogonium* and *Gambusia.* In the second model, continuous doses of 1, 10, or 100 ppb trifluralin in ethanol were introduced. *Helosoma, Oedogonium* and *Gambusia* were the test organisms. Toxic effects were noted in the fish and algae. Tissue concentrations and bioaccumulation ratios of ^{14}C trifluralin as well as trifluralin water concentrations are tabulated for both systems. The lack of trifluralin toxicity in the first model is attributed to the rapid metabolism and degradation of the soil incorporated compound.

80-0671. Fimreite, N.; Kveseth, N.; Brevik, E. M. (Univ. Tromso, N-9000 Tromso, Norway) **Mercury, DDE, and PCBs in eggs from a Norwegian gannet colony.** *Bull. Environ. Contam. Toxicol.* 24(1): 142-144; 1980 (14 references).

Ten gannet (*Morus bassanus*) eggs collected in Norway from a relatively newly established colony in 1972 were analyzed for DDE, PCBs and mercury. Levels were high compared to those found in other species at that time. To determine the change in residue levels, 11 eggs were collected from this colony in 1978. Average mercury levels were 0.58 ± 0.12 ppm in 1972 and 0.80 ± 0.09 ppm in 1978, the ranges were 0.45-0.80 and 0.66-0.94 ppm, respectively. Average residue levels of DDE were 2.1 ± 1.5 ppm in 1972 and 0.66 ± 0.27 ppm in 1978, the ranges were 0.59-5.2 and 0.26-1.2 ppm, respectively. Average PCBs found in 1972 were 7.7 ± 4.6 ppm and 3.5 ± 1.7 ppm in 1978. PCB ranges were 2.1-17 and 1.8-7.4 ppm, for 1972 and 1978 respectively. The DDE levels in 1978 samples were well below those considered harmful but mercury levels were within the range of those associated with negative effects on other birds.

80-0672. Anger, J. P.; Anger, F.; Chauvel, Y.; Curtes, J. P.; Hollenbeck, V. F.; Michaux, P. (Lab. Chim. Anal. Toxicol., UER Med. & Pharm., F-35043 Rennes Cedex, France) **Impregnation des tissus adipeux humains par les organochlores en Ille-et-Vilaine. [Impregnation of human adipose tissues by organochlorines in Ille-et-Vilaine, France.]** *Bull. Med. Leg., Toxicol.* 21(2): 233-245; 1978 (4 references) (French).

Organochlorine pesticide residue levels were determined in human fatty tissue samples obtained at autopsy from 108 subjects who had lived in the agricultural Ille-et-Vilaine area. The samples analyzed consisted of equal portions of perirenal and subcutaneous fat. The total organochlorine residue level averaged 0.88 ppm in 7 premature babies, 2.41 in 5 subjects aged 10-20 yr, 3.25 ppm in 14 subjects in the 20-30 yr age bracket, 3.21 ppm in 9 subjects in the 30-40 yr age bracket 2.99 ppm in 21 subjects aged 40-50 yr, 3.5 ppm in 15 subjects aged 50-60 yr, 4.17 ppm in 23 subjects aged 60-70 yr, and 3.71 ppm in 14 subjects aged 70-80 yr. The average was 3.48 ppm in the 101 subjects aside from the premature babies; 3.42 ppm in men and 3.47 ppm in women. In the men, the α-BHC level averaged 0.43 ppm, the lindane level 0.38, heptachlor epoxide 0.27, dieldrin 0.12, DDE 1.13, p,p'-DDD (TDE) 0.37, p,p'-DDT 0.64 ppm. In the women, the corresponding averages were 0.46 ppm for α-BHC, 0.38 ppm for lindane, 0.26 ppm for heptachlor epoxide, 0.18 ppm for dieldrin, 1.17 for DDE, 0.37 ppm for p,p'-DDD, and 0.66 ppm for p,p'-DDT. The average was 3.39 ppm in urban dwellers and 3.55 ppm in rural dwellers. The averages were 3.4 ppm in 34 subjects who died of accidents or suicide, 3.37 ppm in 10 subjects who died of infectious diseases, 3.35 ppm in 31 subjects who died of cardiovascular diseases, 4.25 ppm in 13 subjects who died of cancer, and 3.97 ppm in 21 subjects who displayed hepatic diseases.

80-0673. Flores Rodriguez, M. (Dep. Microbiol., Fac. Cienc. Biol., Univ. Complutense Madrid, Madrid, Spain) **Accion de los herbicidas sobre la microflora del suelo. [Action of herbicides on soil microflora.]** *Ciencias (Madrid)* 43(1): 8-10; 1978 (Spanish).

Studies on the effects of herbicides on soil microorganisms and on the degradation of herbicides by such microorganisms are reviewed. The growth of aerobic bacteria is inhibited by phenoxy herbicides. High doses of some herbicides reduce the ammoniafying capacity of the soil. Nitrifying bacteria are inhibited by 2,4-D (50 ppm), carbamates, DNOC, and dinoseb; the growth inhibition is dose-dependent and reversible. The growth of *Azotobacter* is inhibited by 2,4-D at 1,000 ppm. *Nocardia* and *Arthrobacter* are able to attack 2,4-D and other phenoxy herbicides. Simazine is degraded by fungi and Actinomycetes.

80-0674. Hunt, T. W. (North Carolina State Univ., Raleigh, NC) **Residue studies with alachlor, ethoprop, and cyhexatin on several horticultural crops.** *Diss. Abstr. Int. B* 40(4): 1437; 1979.

Residue studies were conducted to determine the levels of alachlor on cabbage, ethoprop on seven garden vegetables, and cyhexatin on watermelons during 1976 and 1977. All crops were field grown. Cabbage samples from two locations treated at rates of 0, 3.36, and 6.72 kg/ha of alachlor immediately after transplanting contained residues below the detectable limit of 0.01 ppm. Residue levels of alachlor in soil samples from the plots which received the 3.36 kg/ha rate decreased from 0.72 to 0.07 ppm at one location and from 0.72 to 0.08 ppm at the other location during the 10 and 11 wk of each experiment, respectively. Plots receiving the 6.72 kg/ha rate of alachlor had residues which decreased from 1.58 to 0.10 ppm and from 1.89 to 0.22 ppm for each location, respectively. Filter papers were placed in the plots of one location to verify the rate of application. Only 63 and 70% of the calculated application rate was recovered from the filter papers for the 3.36 and 6.72 kg/ha, rates, respectively. Ethoprop residues on tomatoes, cucumbers, and lettuce grown in soil treated at a rate of 0, 3.36, 6.72, and 13.44 kg/ha were below the low detectable limit of 0.005 ppm. Residues as high as 0.018, 0.068, 0.035, 0.281, and 0.345 ppm were found on snap beans, onions, turnip roots, turnip greens, and radishes, respectively, from plots treated with the 13.44 kg/ha of ethoprop. The number of harvested turnips (> 5 cm), number of harvested radishes, and the average radish weight were significantly decreased by the higher rates of ethoprop. Residues of 0.14 and 0.27 ppm were found on watermelons immediately after treatment with 1.12 and 2.24 kg/ha of cyhexatin, respectively. After 7 days, the cyhexatin residues had decreased to about half those found immediately after treatment. Analyses of peel, rind, and flesh portions indicated that cyhexatin was not translocated within watermelons. Slight to moderate phytotoxic effects to watermelon vine foliage resulted when sprayed with cyhexatin. (Author abstract by permission, abridged. Copies of are available from University Microfilms, order No. 7923050)

80-0675. Parker, L. W. (Colorado State Univ., Fort Collins, CO) **Kinetics of the microbial decomposition of 2,4-D in soil.** *Diss. Abstr. Int. B* 40(4): 1464-1465; 1979.

The kinetics of the degradation of 2,4-D in Ascalon sandy loam under laboratory conditions was studied in relation to 2,4-D concentration, moisture, temperature, and the growth and activity of 2,4-D-degrading populations of microorganisms. Two first-order reactions were observed, one slow (slow phase) and the other fast (fast phase). The duration of the slow phase increased linearly with increasing initial herbicide concentration, going from 11 to 28 days over the range of 1.3-25 μg 2,4-D/g soil. The increase in the duration of the slow phase was a result of decreased growth rates. Growth efficiency values (percentage 2,4-D carbon converted to biomass) indicate a possible adaptation to 2,4-D as a substrate. The numbers of 2,4-D degraders, as determined by a most-probable-number method, increased linearly with time of incubation. The maximum number (2.2×10^5/g soil) occurred during the fast phase when the herbicide was 55% decomposed. Rates of 2,4-D degradation measured for short periods indicated that decomposer activity during the slow phase was due to the presence of a rapidly induced enzyme system (less than 3 hr) or a constitutive enzyme system. Instantaneous rates were significantly reduced when glucose was added to soil and incubated with the herbicide, indicating the presence of a glucose-inhibited enzyme system. The predominant decomposers isolated were of the coryneform group. Even though several populations were present, no differences were observed with respect to the effects of temperature and moisture and time of incubation on the degradation activity as shown by the lack of significant differences in activation energy values (22.85 kcal/mol) for soils incubated with 25 μg 2,4-D/g soil. Kinetic data suggest the presence of at least two 2,4-D degrading enzyme systems; one dominates at low herbicide concentrations (below 10 μg/g soil) and the other above this level. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7923369)

80-0676. Shearls, E. A. (Indiana Univ., Bloomington, IN) **Distribution of chlorinated hydrocarbon pesticides at Lake Monroe, Indiana.** *Diss. Abstr. Int. B* 40(4): 1522; 1979.

Chlorinated hydrocarbon pesticide residues were studied at Lake Monroe, Indiana, from June 1969 to June 1971. Lake Monroe had heavy pre-impoundment pesticide usage but little post-impoundment usage. Aerial transport was the major entry pathway except for aldrin (soil particles). Residue levels and bioconcentration were lower than those usually found elsewhere. Water levels of aldrin,

dieldrin, and lindane were typically less than 10 ppt with aldrin an dieldrin peaks to 4 ppb. The DDT complex was detected only twice in the water. Bottom sample levels were usually less than 0.1 ppb for aldrin (peak 4.6 ppb) and 2 ppb for dieldrin (peak 5.3 ppb). Peaks for the DDT complex and lindane were less than 0.5 ppm in phytoplankton and less than 1 ppb in macrophytes. Most fish contained trace or nondetectable levels but some exceeded 50 ppb. Levels were not correlated with length or weight. Variability in fish levels implied dietary intake. Aldrin and dieldrin were highly variable in water, phytoplankton, and (aldrin only) bottom samples. Biological activity and particulate density influenced macrophyte and bottom residue levels and water depth affected resuspension and resorption from sediments. Pesticides were apparently associated with microparticulates (less than 64 μm), to which they may have been so tightly bound as to markedly reduce bioconcentration. Much of the variability in bioconcentration factors elsewhere may be de to differences in microparticulate concentration and binding. Other factors contributing to low pesticide levels at Lake Monroe include low organic content of bottom material, intermediate productivity, slow and frequently intermittent headwaters, rapid flushout, and erosion control. Lake Monroe pesticide dynamics indicate that reservoirs can sometimes recover rapidly from heavy pesticide usage, that bioconcentration from low levels can be insignificant, and that long range transport may pose no threat to some aquatic environments. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7921307)

80-0677. Lukowski, A. B. (Dep. Zool. & Ecol., Inst. Zool., Univ. Warsaw, Warsaw, Poland) **The content of organochlorine insecticides in the tissues of the great crested grebe (*Podiceps cristatus* L.) and the coot (*Fulica atra* L.) from the Masurian lakes in different phenological periods.** *Ekol. Pol.* 26(3): 439-465; 1978 (44 references).

Tissues of 71 great crested grebes and 101 coots collected at 2 Polish lakes were analyzed for chlorinated hydrocarbon residues. The levels of Σ DDT [*p,p'*-DDT, *p,p'*-DDD (TDE), and *p,p'*-DDE], γ-HCH (lindane), and *p,p'*-DMDT (methoxychlor) in livers, muscles, and fat of the birds were found to vary seasonally. Highest pesticide levels in all birds occurred during the post-breeding period, and residue levels were consistently higher in grebes (1.07-114.3 ppm). Lowest concentrations of all pesticides in grebes (0.24-11.4 ppm) and coots (0.06-51.3 ppm) occurred during the nesting months. The lower levels of contamination observed during the breeding period is thought to be a transitional stage related to insecticide condensation as a result of gradual depletion of fat during the breeding season and in the molting phase.

80-0678. Simonffy, Z.; Vidane Poroszlay, B.; Horvathne Jancso, E.; Tiline Frigyer, I. (EHESZ Cent. Lab., Minist. Food & Agric., H-1091 Budapest, Hungary) **Egeszsegre artalmas vegy anyag- (peszticid-) maradekok mennyisegenek alakulasa allati eredetu elemiszerekben. [The quantity of toxic remnants (pesticides) in food products of animal origin.]** *Elelmez. Ipar* 33(8): 310-313; 1979 (Hungarian).

Total DDT and BHC levels were determined in 1,138 samples of food products of animal origin in 1978 and compared with corresponding findings obtained in 1973. In pork, beef, sausage, and other processed meats, the total DDT level averaged 0.000-0.122 mg/kg in 1978, compared with 0.017-0.479 mg/kg in 1973; the residue levels have decreased to 5.9-42.9% of the 1973 levels. The total DDT levels exceeded the maximum allowable concentrations in 1.43% of the 209 lard samples, and in 1.9% of the 12 beef fat samples in 1978. The total DDT residue levels found in 1978 were 0.005 mg/kg in milk and milk products, 0.081 mg/kg in chickens and hens (fatty tissue), 0.097 mg/kg in goose liver, 0.169 mg/kg in turkey (fatty tissue), 0.862 mg/kg in pheasants and partridges, 0.587 mg/kg in wild ducks and wild geese (fatty tissue), 0.211 mg/kg in boar (fatty tissue), and 0.34 mg/kg in egg powder. The BHC levels in the 1138 samples averaged 0.000-0.029 mg/kg in pork, beef, milk and milk products, and 0.002-0.33 mg/kg in the poultry, game, and egg powder samples.

80-0679. Hoerschelmann, H.; Polzhoffer, K.; Figge, K.; Ballschmiter, K. (Zool. Inst. & Zool. Mus., Univ. Hamburg, Abt. Ornithol., D-2000 Hamburg 13, BRD) **Organochlorpestizide und polychlorierte biphenyle in vogeleiern von den falklandinseln und aus Norddeutschland. [Organochlorine pesticides and polychlorinated biphenyls in bird eggs from Falkland Islands and from north Germany.]** *Environ. Pollut.* 20(4): 247-269; 1979 (20 references) (German).

Comparisons were made of the levels of organochlorine pesticides [*p,p'*-DDD (*p,p'*-TDE), *p,p'*-DDE, *p,p'*-DDT, dieldrin, endrin, heptachlor epoxide, HCB (hexachlorobenzene), α-HCH (α-BHC), β-HCH (β-BHC), γ-HCH (lindane), δ-HCH (δ-BHC)] and polychlorinated biphenyls in 46 eggs of sea, coastal, and some inland birds, and 47 eggs of comparable north German species. Falkland sea bird eggs contained 0.001-0.007 ppm HCB, 0.003-0.029 ppm *p,p'*-DDE, and 0.003-0.17 ppm *p,p'*-DDT. Contaminant levels in Falkland and north German coastal bird eggs were: HCH, and (not detectable)-0.020 ppm; HCH, 0.001-0.046 ppm; heptachlor epoxide, 0.005-0.039 ppm; DDE, nd-0.439 ppm; and dieldrin, 0.003-0.187 ppm. Falkland and north German inland birds contained nd-0.018 ppm HCB, 0.001-0.039 ppm HCH, 0.001-0.021 ppm heptachlor epoxide, nd-0.553 ppm DDE, and nd-0.071 ppm dieldrin. It was determined that the levels in eggs from the isolated Falkland Islands were an order of magnitude lower than in eggs of north German species. It is suggested that the pesticide levels in these island eggs indicate general global contamination levels and can reflect consequences of industrial changes.

80-0680. Malik, S. K.; Yadav, P. R. (Haryana Agric. Univ., Hissar, Haryana 125004, India) **Persistence of aldicarb in soil and its translocation into cotton seeds.** *Indian J. Argic. Sci.* 49(9): 745-748; 1979 (13 references).

Investigations were carried out to determine the persistence of aldicarb in sandy-loam soil and its translocation from treated soil into cotton seed. Aldicarb 10% granules were applied at rates of 1, 2, and 4 kg AI/ha 2 mo after sowing cotton. Soil samples from a depth of 15 cm were collected 0, 15, 30, 60, 90, and 120 days after treatment. Seed samples were collected 120 and 150 days after treatment. Aldicarb residues in soil and cotton seeds were determined colorimetrically. The initial aldicarb deposits in the soil were 5.78, 10.85, and 19.99 ppm for the 1, 2, and 4 kg AI/ha dosages. Initial degradation was very fast, with levels of 2.63, 6.19, and 12.14 ppm on the fifteenth day, and 1.92, 2.81, and 6.42 ppm on the thirtieth day after treatment. Residues persisted for 60 days with the 2 kg AI/ha treatment, and for 90 days with 4 kg AI/ha. At 120 days after treatment the aldicarb residues in cotton seeds were 0.02, 0.03, and 0.05 ppm, all below the tolerance level of 0.1 ppm. At 150 days after treatment all aldicarb residues in cotton seeds were below the detectable level. It is concluded that cotton seed from crop raised with up to 4 kg AI/ha aldicarb can be fed to cattle and can safely be used to prepare vegetable oil.

80-0681. Belyea, R. L.; Martz, F. A.; McIlroy, W.; Keene, K. E. (Dep. Dairy Sci., Univ. Missouri, Columbia, MO 65201) **Nutrient composition and contaminants of solid cellulosic waste.** *J. Anim. Sci.* 49(5): 1281-1291; 1979 (27 references).

A study was conducted to provide more information about the nutrient potential of solid cellulosic waste (SCW), to determine the organic and inorganic contamination of SCW, and to assess the effects of processing methods on nutrient and contaminant content of SCW. SCW samples which had undergone various types of physical processing and farm diet (corn silage and grain) were analyzed for dry matter, ash, crude protein, neutral detergent fiber, acid detergent fiber, acid detergent lignin, cellulose and *in vitro* dry matter digestibility (IVDMD). Harmful inorganic contaminants were determined by atomic absorption spectrophotometry and organic contaminants by gas-liquid chromatography with electron capture detection. Toxic levels of lead and arsenic were observed, while mercury, cadmium and chromium were marginal. Some samples contained benzene hexachloride isomers (BHC; 0.15-0.19 ppm), chlordane isomers (0.10-0.32 ppm), and dieldrin (0.12-0.17 ppm) in excess of FDA tolerances for feedstuffs, while Σ DDT (1.0-3.0 ppm), endrin (0.1 ppm) and methoxychlor were within tolerance levels. PCBs were very close to, or greater than the FDA tolerance. Other pesticide residues found included heptachlor epoxide, aldrin, toxaphene and hexachlorobenzene. Determination of residue levels for these contaminants was prevented by PCB contamination, but were estimated to be about 0.5 ppm. The most digestible and least contaminated SCW was found to be the corrugated fraction, and this was suggested to have the greatest potential for use in ruminant diets.

80-0682. Ivey, M. C.; Palmer, J. S. (Vet. Toxicol. & Entomol. Lab., Agric. Res., SEA, USDA, College Station, TX 77840) **Chlorpyrifos and 3,5,6-Trichloro-2- pyridinol: residues in body tissues of swine treated with chlorpyrifos for hog louse and itch mite control.** *J. Econ. Entomol.* 72(6): 837-838; 1979 (1 reference).

Residues of chloropyrifos and its metabolite pyridinol, 3,5,6-trichloro- 2-pyridinol, were determined in abdominal fat, muscle, liver, and kidney tissues of swine at weekly intervals after they had been treated with Dursban 44 Insecticide Formulation (43.2% chlorpyrifos) at the rate of 1 ml/22.68 kg (50 lb) of body wt as a pour-on application for control of the hog louse, *Haematopinus suis* (L.) and the itch mite, *Sarcoptes scabiei* (De Geer). Chlorpyrifos residues (maximum 0.406 ppm at 1 wk slaughter) were found in fat tissue for 3 wk posttreatment and in muscle tissue at 1 wk posttreatment. Residues were not detected in liver and kidney tissues. Pyridinol residues (maximum 0.317 ppm at 1 wk slaughter) were present in fat, muscle (1 animal only), liver, and kidney tissues at 1 wk posttreatment and in only fat and liver tissues at 2 wk posttreatment. Residues of chlorpyrifos and pyridinol were not detected in tissues after 3 wk posttreatment. No adverse effects to the animals resulted from this type of treatment. (Author abstract by permission)

80-0683. De Campos, M.; Gutierrez, C. E.; Olszyna-Marzys, A. E. (Inst. Nutr. Cent. America & Panama, Guatemala City, Guatemala) **Correlation between total DDT residues in blood and fat of beef animals.** *J. Food Prot.* 42(12): 948-949, 953; 1979 (10 references).

Samples of blood and fat were taken from bovines in regions of Guatemala where pesticides are heavily sprayed for cotton field protection. Samples were analyzed by gas-liquid chromatography. DDT values were 1.76-26.20 ppb in blood, and 0.87-38.10 ppm in fat. The ppm in fat/ppb in blood ratio was calculated to be 0.96±0.39. A correlation was found between DDT levels in blood and in the body of the animals. It was suggested that blood analysis is a useful means of determining before slaughter whether the residue levels in the fat of the animal will exceed the legal limits for consumption.

80-0684. Flickinger, E. L. (Gulf Coast Field Stn., Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Victoria, TX 77901) **Effects of aldrin exposure on snow geese in Texas rice fields.** *J. Wildl. Manage.* 43(1): 94-101; 1979 (15 references).

In 1972 and 1974, 112 dead or moribund snow

geese (*Chen c. caerulescens*), mostly immature white-phase males, were found in a study area on the Garwood Prairie, Texas. Dying geese were observed within 2 days after rice fields planted with aldrin-treated seed were flooded by heavy rains on 21 March 1972 and 25 March 1974. Brains from 8 snow geese that were moribund when found contained an average of 8.2 ppm (4.9-14.0 ppm) of dieldrin (a metabolite of aldrin); brains of 14 geese found dead contained an average of 14.1 ppm (2.1-31 ppm). Because no mortalities occurred in 1973 when aldrin-treated rice seed was flooded after all geese had migrated or in 1975 and 1976 after the treatment of rice seed with aldrin was suspended, it appears certain that aldrin caused the mortalities. (Author abstract by permission)

80-0685. Pushkina, G. P.; Vekshin, B. S.; Bukina, N. V.; Vorob'eva, O. N. (All-Union Res. Inst. Pharm. Plants, Moscow, USSR) **Izuchenie peredvizhenia i razlozhenia treflana v pochve v usloviakh Moskovskoi oblasti. [Study of treflan migration and decomposition in the soil under conditions of the Moscow region.]** *Khim. Farm. Zh.* 13(6): 73-76; 1979 (13 references) (Russian).

The migration and degradation of Treflan (trifluralin) in the soil were studied. Treflan was applied to a calendula crop at a rate of 4 kg/ha. It was found that 30 days after incorporation 56% of the herbicide was detected in the 0-10 cm layer, while 44% was detected in the 10-20 cm layer. Within 3 mo of application 88% of the herbicide was detected in a 0-10 cm layer and only 12% in the 10-20 cm layer. Treflan was subject to marked degradation in the soil, and 1 yr after incorporation the herbicide could not be detected in the soil (62% and 30% of applied amount was detected 1 mo and 3 mo, respectively, after incorporation). The rate of Treflan degradation was found to depend upon the soil humidity.

80-0686. Gaziev, M. T. (Azerbaidzhan Res. Inst. Plant Prot., Baku, USSR) **Vliianie gerbitsidov na mikrofloru pochvy na vinegradnikakh. [Effect of herbicides on soil microflora in vineyards.]** *Khim. Sel'sk. Khoz.* 17(5): 61-63; 1979 (7 references) (Russian).

The effects of the herbicide glyphosate (3.5 kg/ha), simazine (10 kg/ha), dalapon (10 kg/ha), and Eradicane (EPTC; 10 kg/ha) on the microflora of the vineyard were studied. Soil samples were collected 3, 10, 20, 60 days, and 1 yr after application. It was found that on day 3 of application the incidence of bacteria and Actinomyces in the soil was lower than in control. On day 20, the total number of bacteria exceeded the control value with simazine, while the incidence of *Actinomyces* was greater in the control than in the soils treated with Eradicane. On day 20 of the treatment with dalapon and glyphosate the incidence of both bacteria and *Actinomyces* was greater than in the controls.

80-0687. Zhukova, P. S.; Shirko, T. S. (Byelorussian Res. Inst. Potato Fruit & Veg. Grow., Gorki, USSR) **Ostatki gerbitsidov v pochve i ovoshchakh. [Herbicide residues in soil and vegetables.]** *Khim. Sel'sk. Khoz.* 17(6): 46-50; 1979 (23 references) (Russian).

The results of laboratory and field trials on the rate of degradation of a series of herbicides in the soil and vegetable crops are presented. Analysis of the rate of degradation of herbicides in the soddy medium podzolized soil showed that on day 77 of incorporation there were no Betanal (phenmedipham) residues after application of 0.75-1.5 kg/ha, while after application of 2.25 kg/ha, Betanal residues comprised 16% of the applied amount. On day 77 of incorporation, residues of Semeron (desmetryne; 0.9 kg/ha) and prometryne (3 kg/ha) comprised 17.0% and 8.7%, respectively, of the applied amount. After the treatment of onion seedlings with Mezoranyl (aziprotrynl; 1.5-3 kg/ha), Ramrod (propachlor; 6-8 kg/ha) and prometryne (1.5-3 kg/ha), the harvest contained trace amounts of herbicides. Prometryne and linuron did not accumulate in carrots; Semeron, Ramrod, and Mezoranyl did not accumulate in the cabbage; Betanal, Pyramine (pyrazon), and Eptam (EPTC) did not accumulate in beets.

80-0688. Gar, K. A.; Zamanskaya, I. Sh.; Syrova, L. M.; Gushchina, N. I. (All-Union Res. Inst. Chem. Means Plant Prot., Moscow, USSR) **Ostatki geterofosa v pochve i tomatakh. [Heterofos residues in soil and tomatoes.]** *Khim. Sel'sk. Khoz.* 17(6): 50-53; 1979 (3 references) (Russian).

The results of trials of resistance of the new systemic nematicide Heterofos (*O*-ethyl *O*-phenyl S-propyl thiophosphate) in the environment are presented. Heterofos was incorporated at a rate of 20 mg/kg AI into different types of soil (500-600 kg/ha for a 5% granular formulation and 50-60 kg/ha for a 50% e.c.). Within 1 wk of incorporation tomato seedlings were planted. Samples of plants and soil were collected during a 4 mo period, and the residues of Heterofos were assessed by gas chromatography. It was found that the rate of Heterofos degradation was approximately equal in different types of soils: 70-90% of the herbicide broke down within the first 30-40 days. Small amounts of Heterofos (0.1-1 mg/kg) were retained in the soil for 120 days. Within 30-50 days of application concentrations of Heterofos in tomato roots were 5-10 times greater than in the soil. Later, the level of herbicide in roots decreased, and 60-70 days after application comprised 0.2-1 mg/kg. Heterofos could not be detected in the tomato crop.

80-0689. Vyberal'ski, E. (Inst. Chem. & Plant Prot., Acad. Agric., Szczecin, Poland) **Dinamika razlozheniia khlorfenvinfosa v kartofele i pochve. [Dynamics of degradation of chlorfenvinphos in potatoes and soil.]** *Khim. Sel'sk. Khoz.* 17(9): 44-45; 1979 (Russian).

The degradation of chlorfenvinphos in soil and potato tubers was studied in field tests on sandy loam with 1.36% humus content and pH = 6.4. Chlorfenvinphos was applied at the rate of 0.25 kg/ha or 1 kg/ha. The reduction of the residue levels in the soil and potato tubers was dose-dependent. The residue levels measured in the soil immediately after treatment were over 0.5 mg/kg (1 kg/ha) and nearly 0.4 mg/kg (0.25 kg/ha), respectively. The corresponding levels measured 90 days after treatment were about 0.1 mg/kg (1 kg/ha) and less than 0.5 mg/kg (0.25 kg/ha), respectively. The residue levels measured in the potato tubers 3 days after treatment with 1 and 0.25 kg/ha doses were nearly 0.07 mg/kg and less than 0.05 mg/kg, respectively. Regardless of the dose, only traces were found 14 days after treatment; no residues were found at later dates.

80-0690. Goerke, H.; Eder, G.; Weber, K.; Ernst, W. (Inst. Meeresforsch., D-2850 Bremerhaven, BRD) **Patterns of organochlorine residues in animals of different trophic levels from the Weser Estuary.** *Mar. Pollut. Bull.* 10(5): 127-133; 1979 (21 references).

Four invertebrate (edible cockle, soft clam, lugworm, and brown shrimp), and one fish (common sole) species from the tidal flats of the Wadden Sea, Germany were analyzed for organochlorine pesticide contents. *p,p'*-DDT, endrin, and heptachlor epoxide could not be detected at detection limits of 3, 1, and 0.3 ng/g, respectively. Concentrations of *p,p'*-DDD (TDE), dieldrin, α- and γ-BHC (lindane), and *p,p'*-DDE ranged between 1-10 ng/g wet tissue. PCB residues predominated in all samples in concentrations ranging from 10 to 200 ng/g. There was no consistent pattern of residue concentrations among the 5 species investigated. Trophic levels and lipid content were shown to be correlated with PCB residues, and increased from bivalves to fish.

80-0691. Cole, H. A. (Author address not given) **Monitoring chemical residues in fish and shellfish.** *Mar. Pollut. Bull.* 10(12): 342-344; 1979 (2 references).

A review is presented of 2 papers which provide extensive data on chemical residues in fish and shellfish landed in England and Wales from 1970-1974. The substances analyzed were mercury, cadmium, lead, chromium, zinc, copper, DDT, TDE (DDD), DDE, γ-HCH (lindane), α-HCH (BHC), dieldrin, and PCB. The lack of early standardization of samples makes it difficult to compare results from different years. In general, the monitoring program gives reassurance regarding the condition of fish and shellfish landed in these areas. Lead concentrations in fish flesh were generally below the level of detection, but were higher in shellfish. It is stated that the levels of organochlorine pesticides and PCB differ from species to species, but are low by all standards of safety.

80-0692. Duinker, J. C.; Hillebrand, M. T. J.; Nolting, R. F. (Netherlands Inst. Sea Res., Texel, The Netherlands) **Organochlorines and metals in harbour seals (Dutch Wadden Sea).** *Mar. Pollut. Bull.* 10(12): 360-364; 1979 (24 references).

The levels of PCB, organochlorines, and various metals were determined in the blubber, liver, brain, kidney, spleen and heart of harbor seals from the Dutch Wadden Sea. All data were from animals found dead. Electron capture gas chromatography and GC/MS were used for the organochlorine analysis. In each tissue, the highest concentrations were of PCB (1.10-576 mg/kg wet wt), followed by Σ-DDT (0.05-25.4 mg/kg), mirex (< 0.001-1.3 mg/kg), dieldrin (< 0.001-1.4 mg/kg), α-HCH (α-BHC; < 0.001-0.95 mg/kg), and γ-HCH (lindane; < 0.001-0.39 mg/kg). In most cases the highest concentration of each compound occurs in the blubber. Results were compared with data reported from the German Wadden Sea and the east coast of England.

80-0693. Funtikova, N. S. (Inst. Microbiol., USSR Acad. Sci., USSR) **Razpozhenie linurona gribami rada *Aspergillus*. [Decomposition of linuron by *Aspergillus*.]** *Mikrobiologiya* 48(1): 57-61; 1979 (9 references) (Russian).

The degradation of linuron by *Aspergillus flavus* isolated from soil and by laboratory stocks of *Asperigullus* was studied in Czapak's medium. *A. flavus* was found to transform linuron to 3,4-dichloro aniline (DCA) by demethylation with subsequent hydrolysis of the amide bond; DCA is then acetylated to 3,4-dichloro acetanilide. These products regulate the enzymes involved in demethylation and hydrolytic elimination of the side chain. Carbon sources added to a buffer mixture inhibit the elimination of the side chain. The reduction in the linuron concentration (without regard to adsorption) was 34% in the presence of *A. awamori* 746, 60% in the presence of *A. corneus* 469 and *A. clavatus* 1330, 44% in the presence of *A. fisscheri* 23 and *A. ochraceus* 41, 86% in the presence of *A. nidulans* 31, 72% in the presence of *A. oryzae* 45, 56% in the presence of *A. oryzae* 47, and 0.0% in the presence of *A. kanagawaensis* 1331 and *A. nutans* 1592.

80-0694. Matthey, E. (Abt. Lebensmittelkontrolle, Eidg. Gesundheitsamt, Switzerland) **Die Durchfuehrung der Lebensmittelkontrolle in der Schweiz im Jahre 1978. I. Bericht des Eidgenoessischen Gesundheitsamtes Abteilung Lebensmittelkontrolle. [Food testing in Switzerland in 1978. I. Report of the division of food testing of the federal public health service.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 70: 303-415; 1979 (Multilingual).

The 1978 food testing activity of the Swiss Public Health Service is reported. A new list of maximum allowable pesticide residues has been in effect since September 1978. Excessively high residues of lindane and

its isomers were found in 4% of milk samples investigated. The corresponding percentages were 0% for aldrin, dieldrin, DDT + DDE + TDE, HCB (hexachlorobenzene), and heptachlor epoxide. The average residue levels found in cheese samples were 62 ppb (on fat basis) for β-BHC, 62 ppb for α-BHC, 27 ppb for lindane, 21 ppb for dieldrin, 75 ppb for DDE, 78 ppb for DDT, 62 ppb for TDE, 61 ppb for HCB, and 25 ppb for heptachlor epoxide. Dithiocarbamates, benomyl, folpet, quintozene, captafol, and glycophen were found in lettuce. No traces of atrazine, diazinon, DDT, lindane, α-BHC, and malathion were found in groundwater samples at a sensitivity of 1 μg/l. [This article is the French and German.]

80-0695. Rahman, A. (Soil & Plant Res. Stn., Ruakura Agric. Res. Cent., Hamilton, New Zealand) **Atrazine residues in the soil.** *N. Z. J. Agric.* 139(4): 45, 47; 1979.

Residual activity of atrazine was measured at the end of the maize growing season. The chemical was applied to seven Horotiu sandy-loam soils varying in organic content from 8.2 to 19.1%. When the atrazine was applied at the rate of 1 kg/ha no residual activity was found. However, when 2 kg/ha atrazine was applied the two soils with lowest organic matter content retained enough residues to reduce the yield of test species to a significant degree. The five soils with higher organic matter content were found to be safe for growing susceptible crops.

80-0696. Rahman, A.; Atkinson, G. C.; Douglas, J. A.; Sinclair, D. P. (Soil & Plant Res. Stn., Ruakura Agric. Res. Cent., Hamilton, New Zeland) **Eradicane causes problems.** *N. Z. J. Agric.* 139(3): 47-49; 1979.

Field observations indicated that when Eradicane (which contains the herbicide EPTC) is used for several growing seasons, microbial activity in soils repeatedly exposed to the chemical increases and the herbicide activity decreases. Thiocarbamate herbicides have not previously been shown to be subject to this type of microbial degradation. In tests, soils that had not been treated with Eridacane or with fensulfothion or alachlor, those treated for 1 yr, and those treated for 3 yr demonstrated differential microbial breakdown of the herbicide. Soils treated with Eradicane for 3 yr lost most of their herbicidal activity in 4-6 wk. Soils receiving applications for 1 yr lost some of their activity. It is suggested that only certain soil types are subject to this phenomenon.

80-0697. Fukushima, M.; Kawai, S.; Oda, K.; Uno, G.; Tachikawa, R. (Osaka Munic. Inst. Environ. Sci., Osaka, Japan) **[Water pollution by organophosphorus compounds its specificity in the rivers of Osaka city.]** *Osaka Shiritsu Kankyo Kagaku Kenkyusho Hokoku (Rep. Osaka Munic. Inst. Environ. Sci.)* : 206-207; 1979 (Japanese).

Three organophosphorus pesticides, diazinon, *S*-benzyl diisopropyl phosphorothioate (IBP) and fenitrothion, and 6 industrial organic triesters of phosphoric acid were determined in river waters of Osaka city. The sum of the concentrations of the 3 pesticides during summer was 0.2-0.3 ppm. Concentrations of IBP were highest, followed by diazinon and fenitrothion in the Yodo River. The order of most to least residue present changed to fenitrothion, diazinon and IBP at sampling sites within the municipality.

80-0698. Veeravel, R.; Baskaran, P. (Div. Plant Prot., Fac. Agric. Annamalai Univ., Annamalainagar, India) **Biological longevity of certain insecticide spray deposits on eggplant (*Solanum melongena* L.) as evidenced by aphid bioassay.** *Pesticides* 13(4): 44-45; 1979 (5 references).

In order to study the persistence levels of several pesticides, 35-day-old eggplant seedlings were sprayed with various pesticides, and mortality of aphids reared on them was recorded up to 9 wk. For each pesticide the period for which toxicity persisted and the average residual toxicity were determined. Dimethoate remained longest, causing 100% mortality for up to 6 wk. The absorbance of dimethoate into the foliage is presented as a possible explanation for its persistence. Quinalphos was the least persistent, and was found only up to 4 wk. The use of quinalphos is suggested for vegetables where long-term persistence is not desired. The order of persistence of the pesticides used was dimethoate > endosulfan > phoxim > monocrotophos > quinalphos 0.05% > quinalphos 0.037% > quinalphos 0.025%.

80-0699. Singh, A.; Chawla, R. P. (Dep. Entomol. Punjab Agric. Univ., Ludhiana, India) **Persistence of endosulfan on grapes.** *Pesticides* 13(4): 46-47; 1979 (6 references).

Experiments were designed to determine the residues of endosulfan applied to grapes during the berry maturation stage. Grapevines were sprayed with endosulfan 35% e.c. at 500 ml/100 vine, and the control vines sprayed with water only. Ripe grapes were collected 2 hr and 1, 3, 5, 7, and 15 days after spraying. Endosulfan residues were determined by colorimetry and electron capture gas-liquid chromatography which is capable of separating the isomers α-, β-, and -diol. In general, values obtained by the 2 methods were in fairly good agreement, but the GLC method was found to be superior due to the additional information provided. Endosulfan residues were 11 ppm after 2 hr and 2 ppm after 1 day, followed by a very slow rate of degradation thereafter. α-Endosulfan residues decreased faster than those of β-endosulfan. Possible reasons for the initial high loss of insecticide are discussed. It is concluded that a 1-day waiting period is sufficient for consumption, since the residue levels decrease to the tolerance limit of 2 ppm within that time.

80-0700. Klein, I.; Lavee, S.; Ben-Tal, Y. (Inst. Hortic., Volcani Cent., Agric. Res. Org., Bet Dagan, Israel) **Effect of water vapor pressure on the thermal decomposition of 2-chloroethylphosphonic acid.** *Plant Physiol.* 63(3): 474-477; 1979 (10 references).

Decomposition of ethephon (2-chloroethyl phosphonic acid) was measured using ^{14}C-labeled ethephon and by ethylene release. Various physical parameters (water vapor pressure 0.6-86.9 mm Hg, relative humidity 3.2-93.3%, temperature 20-50°C, and pH 6.3 and 7.0) were simulated in closed systems. Thermal decomposition was determined on 10 µl buffered samples sealed in 700 ml glass jars with 30 ml H_2SO_4. Decomposition measurements by ethylene release were determined on dried 0.0117 µmol ethephon in 17.5 µl buffer samples. The vials were then incubated in 35 ml test tubes containing 5 ml H_2SO_4 at a different density at 20, 30, 40 or 50°C. Air samples were withdrawn at 0.5, 1.5, 3 or 4.5 hr and ethylene was measured gas chromatographically. Thermal decomposition was proportional to the concentration. Log_{10} concentrations were linear versus time at constant pH, temperature and vapor pressure. The decomposition of ethephon increased at increasing water vapor pressures up to an optimum. The optimum vapor pressure approximately doubled for each 10°C increase. Activation energies for the decomposition reaction were 8.7 and 14.3 kcal/mole under water vapor pressures of 3.2-12 mm Hg at pH 6.3 and 7.0, respectively. Ethylene release was comparable to other methods for measuring ethephon decomposition.

80-0701. Sahrawat, K. L. (Div. Agric. Chem., Indian Agric. Res. Inst., New Dehli 110 012, India) **Effects of parathion and malathion on transformations of urea and ammonium sulfate nitrogen in soils.** *Plant Soil* 53(1-2): 11-16; 1979 (16 references).

Sandy loam alluvial soil was used to study the effects of malathion and parathion (applied at concentrations of 10 and 50 µg/g soil) on transformation of urea and $(NH_4)_2SO_4$-N. Samples were analyzed for NH_4^+, NO_2^-, and NO_3^-N weekly, and samples incubated with urea were also analyzed for urea-N. The percentage inhibition of urea hydrolysis or nitrification of ammonium sulfate and urea N by malathion and parathion was calculated. Results indicated that both insecticides retarded urea hydrolysis and nitrification of urea and $(NH_4)_2SO_4$-N. At insecticide concentrations of 50 µg/g soil, urea hydrolysis ranged from 44 to 61% after 0.5 wk, and from 7 to 21% after 3 wk of application. Both insecticides inhibited the conversion of NH_4^+ to NO_2^-, without appreciably affecting the subsequent oxidation of NO_2^- to NO_3-N, leading to an accumulation of higher amounts of NH_4-N in soils treated with ammonium sulfate or urea N. It is concluded that malathion or parathion may influence NH_4^+ or NH_4-forming fertilizers by regulating their rates of mineralization in soils.

80-0702. Sinha, A. P.; Agnihotri, V. P.; Singh, K. (Indian Inst. Sugarcane Res., Lucknow, India) **Effect of soil fumigation with Vapam on the dynamics of soil microflora and their related biochemical activity.** *Plant Soil* 53(1-2): 89-98; 1979 (32 references).

Studies were designed to determine the influence of Vapam (sodium *N*-methyl dithiocarbamate; metham sodium), a potent general biocide, on the populations of soil microflora. Soil samples from a sugarbeet field were treated with Vapam at a rate of 125, 250, 500, and 1000 ppm, and incubated for up to 45 days. Different microbial populations were estimated by dilution plate techniques, using the appropriate medium. Nitrification, ammoniafication, and evolved CO_2 were also determined. Fungal populations were significantly reduced by all concentrations of Vapam for 45 days. In the first 15 days of the study, higher concentrations of Vapam appreciably reduced the population of bacteria and actinomycetes, but later the populations gradually recovered. The Rhizobia populations were decreased by all concentrations of Vapam. Vapam increased CO_2 production for the first 32 days and inhibited soil nitrification. Ammoniafication was stimulated by 125-500 ppm Vapam, but decreased by 1000 ppm Vapam.

80-0703. Burt, G. W.; Holmes, R. L. (Dep. Agron., Univ. Maryland, College Park, MD 20742) **The interaction of nitrogen fertilization, pH and triazine breakdown.** *Proc. Northeast. Weed Sci. Soc.* 33: 120; 1979.

Soil was treated with nitrogen at a rate of 100 lb/A (113 kg/ha) in both the sodium nitrate and liquid nitrogen form. Atrazine was then applied to the soil. Thirty days after application approximately 6% of the atrazine had been metabolized to the hydroxy form. No difference in atrazine metabolism was noted between the 2 methods of adding nitrogen to the soil. In other experiments oat was planted 0, 2, 4, and 6 wk after applying atrazine plus 100 lb/A nitrogen in either form. No differences were found in the quantity of atrazine present in the soil treated with sodium nitrate or with liquid nitrogen.

80-0704. Wu, T. L. (Smithsonian Inst., Chesapeake Bay Cent. Environ. Stud., Edgewater, MD 21037) **The distribution of atrazine in corn field soils at various elevations.** *Proc. Northeast. Weed Sci. Soc.* 33: 121-129; 1979 (11 references).

During the growing season for corn, atrazine was applied to a field at 1.7 kg/ha rates. Different distribution patterns for atrazine became apparent in the surface of the field depending on the elevation. In the fields of lowest elevation atrazine was dispersed more evenly. Total atrazine concentration in soil columns removed for analysis from upper fields were power than were the concentrations found in the lower fields. A pattern of gradual movement after application was developed for the different elevations

of the fields, which eventually showed the atrazine entering the drainage waters. The first storm event occurring after atrazine application was found to be very significant in runoff loss. It accounted for 55% of total runoff loss for the growing season and approximately 90% of the total runoff loss occurring within 2 months of planting. The presence of atrazine residues 1 yr after field application supported the conclusion of atrazine carry-over.

80-0705. Zahnow, E. W.; Riggleman, J. D. (Biochem. Dep., E. I. du Pont de Nemours & Co. Inc., Wilmington, DE) **Search for linuron residues in tributaries of the Chesapeake Bay.** *Proc. Northeast. Weed Sci. Soc.* 33: 131; 1979.

Samples of mud and water were taken from areas of the Chesapeake Bay which were considered likely to show contamination with linuron if the chemical was being transferred from agricultural fields into the water. Samples were analyzed by an extraction procedure followed by liquid chromatography. The samples contained < 10 ng linuron/l in mud and < 0.2 μg/l in water. It was concluded that linuron was not accumulating in the Chesapeake Bay.

80-0706. Daum, C. P.; Hartwig, N. L.* (Dep. Agron., Penn State Univ., University Park, PA 16802) **Effect of glyphosate on the activity of cyanazine in simultaneous application.** *Proc. Northeast. Weed Sci. Soc.* 33: 343; 1979.

Air-dried cyanazine was shown to decompose in the presence of glyphosate. Decomposition increased with contact time, and was significant after 1 and 2 days. Field trials indicated that slightly better annual grass control was obtained when a cyanazine - glyphosate mixture was immediately leached in, rather than remaining on the soil surface for 2 days. No loss of cyanazine activity was indicated when cyanazine was tank mixed with glyphosate, applied preemergence, and leached in within a day of a application. The use of distilled and hard water herbicide carriers had no effects on cyanazine activity. Effects of ultraviolet light on weed control activity of a cyanazine + glyphosate mixture were evaluated. UV light was produced by a metal halide lamp at an intensity of 300 and 100 $\mu W/cm^2$ in the 220-280 and 300-400 nm wavelength ranges, respectively. The mixture was irradiated after it was applied preemergence to annual grasses at rates of 1.12 and 2.24 kg/ha. After 160 min of irradiation no effect on cyanazine activity was noted.

80-0707. Albert, L.; Martinez, M. G.; Gonzalez, E. (Dep. Quim., Cent. Invest. & Estud. Adv., Inst. Politec. Nac., Mexico 14, D.F., Mexico) **Plaguicidas organofosforados I. Residuos de insecticidas organofosforados en algunas alimentos mexicanos. [Organophosphorus pesticides. I. Residues of organophosphorus insecticides in Mexican agricultural products.]** *Rev. Soc. Quim. Mex.* 23(4): 189-196; 1979 (15 references) (Spanish).

Food products of vegetable origin were analyzed for organophosphorus pesticide residues by TLC. Phorate residues were found in 70% of rice and 60% of tomato samples; malathion in 80% of avocado samples and in 70% of the rice, tomato, and lettuce samples; parathion in 80% of avocado samples, in 30% of rice samples, in 70% of strawberry and tomato samples, and in 20% of lettuce samples. Methyl parathion was found in 60% of avocado samples, in 40% of rice samples, in 30% of strawberry samples, and in 50% of tomatoes. Guthion (azinphos methyl) was found in 50% of avocados and strawberries, in 40% of rice samples, in 10% of tomatoes, and in 70% of lettuce samples. Diazinon was found in 20% of avocados and in 30% of lettuce samples. Ethion was found in 10% of the tomatoes. The phorate levels were 0.2-1.4 mg/kg, the malathion levels 0.3-1.4 mg/kg, the parathion levels 0.1-0.7 mg/kg, the methyl parathion levels 0.3-0.8 mg/kg, the guthion levels 0.2-0.9 mg/kg, and the diazinon levels 0.1-0.2 mg/kg.

80-0708. Peyron, L. (Lautier Aromat. Grasse, France) **Solvants volatils et pesticides residuaires dans les aromatisants. [Volatile solvent and pesticide residues in spices.]** *Riv. Ital. Essenze, Profumi, Piante Off., Aromat., Syndets, Saponi, Cosmet., Aerosols* 61(2): 46-52; 1979 (70 references) (French).

Findings on pesticide residues [aldrin, dieldrin, endrin, heptachlor, heptachlor epoxide, chlordane, lindane, ΣHCH (ΣBHC), ΣDDT, toxaphene, endosulfan, and methoxychlor] in natural spices and spice extracts are reviewed. Based on an annual per-capita spice consumption of 10-40 g, the total annual per-capita pesticide intake from spices is estimated at 0.2-1 mg, versus 60-250 mg with food in general, exclusive of spices. It is concluded that the risks due to pesticide residues in spices are negligible.

80-0709. Kimble, B. J.; Gross, M. L. (Lab. Energy Relat. Health Res., Univ. California, Davis, CA 95616) **Tetrachlorodibenzo-*p*-dioxin quantitation in stack-collected coal fly ash.** *Science* 207(4426): 59-61; 1979 (17 references).

Gas chromatography- high resolution mass spectrometry has been used to quantitate tetrachlorodibenzo-*p*-dioxin (TCDD) in fly ash collected from the stack of a typical commercial coal-fired power plant. No TCDD was detected in this fly ash, but minute traces may be present below the detection limit of 1.2 parts per trillion (by weight). This finding indicates that this type of fossil-fueled power plant is not a large source of this compound in environmental samples, in contrast to the conclusions presented in a recent industrial report. (Author abstract by

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80-0710. Inuyama, Y.; Soda, T. (Shimane Prefect. Public Health Lab. Matsue, Shimane, Japan) **[Results of investigation of fenitrothion residues due to aerial application for controlling *monochamus alternatus* on pine trees.]** *Shimane-ken Eisei Kogai Kenkyusho Gyoseki Hokoku (Res. Rep. Shimane Prefect. Publ. Health Lab.)* 20: 92-93; 1978 (2 references) (Japanese).

Residues of fenitrothion were determined in river water and the plants *Equisetum arvense* and *Artemisia princeps* immediately, and 1, 2, and 3 days after aerial application of a 10 X dilution of 50% e.c. fenitrothion. Residue determinations were based on chromatographic analyses using river water and n-hexane extracts of the plant matter. No pesticide was detected in river water before the fenitrothion application. After application, residue levels in river water were ND (not detectable)-0.678 ppm (immediately after), ND-0.00276 ppm on day 1, trace-0.0116 ppm on day 2, and ND-0.003 ppm on day 3. Pesticide residues in *Equisetum* were 2.78, 0.29, and 0.14 ppm 1, 2, and 3 days after application, respectively. Residues in *Artemisia* were 7.50, 0.98, and 2.05 ppm 1, 2, and 3 days after application, respectively. It was concluded that the fenitrothion residues in river water were harmless to fishes.

80-0711. Anonymous **Contamination by hardy herbicide.** *Smithson. Inst. Res. Rep.* 26(3): 7-8; 1979.

The herbicide atrazine was found in samples from the Rhode River (6-190 ppt) and in rainwater collected in Edgewater, MD (3-2190 ppt). Atrazine is heavily used on Maryland cornfields, and is applied as a spray in combination with water and emulsifiers. The highest atrazine level in rainwater was detected in May after spraying had been performed. However, atrazine levels detected in winter months were generally found to be higher than summer levels. It is suggested that atrazine found in rainwater consisted of particles and vapors washed from the atmosphere, and that atrazine in the atmosphere may remain for long periods of time and travel long distances.

80-0712. Kuthubutheen, A. J.; Pugh, G. J. (Dep. Biol. Sci., Univ. Aston, Birmingham B4 7ET, England) **The effects of fungicides on soil fungal populations.** *Soil Biol. Biochem.* 11(3): 297-303; 1979 (33 references).

Test plots of sandy loam soils were sprayed at 28 day intervals for 1 yr with 1 of 4 fungicides; captan at 9 kg/ha, dicloran at 2 kg/ha, thiram at 6.7 kg/ha or Verdasan (phenylmercury acetate; PMA) at 12 kg/ha. Immediately after spraying the fungicides reduced both target and non-target fungal populations by 23, 11, 36, and 50%, respectively. Captan and dicloran treated plots were rapidly recolonized within 7 days of fungicide application. Thiram and Verdasan treated soils never fully recovered their initial numbers of fungal propagules throughout the sampling period. Fewer fungal species were isolated from thiram or Verdasan dosed soils than from captan or dicloran sprayed plots. *Chrysosporium pannorum* was found to detoxify Verdasan, utilize it as a carbon source and proliferate in the Verdasan treated soils. The relative abundance of *Trichoderma viride* and *Botryotrichum piluliform* can also be used as indicator species of organomercurial fungicide pollution; they were deleteriously affected by the presence of the mercurial fungicide. Thiram degradation was postulated to produce fungitoxic products in addition to its own fungicidal action. Captan and dicloran soils were rapidly recolonized possibly due to shorter persistence of these fungicides in the soils.

80-0713. Touzaa, M. G. (Author address not given) **Ce que fait le Service de la Protection des Vegetaux. [What the Plant Protection Service does.]** *Trav. Soc. Pharm. Montpellier* 39(2): 87-98; 1979 (French).

The activity of the Plant Protection Service of the Provence, Alps, Cote d'Azur and Corsica areas is described. Dissemination of information on the protection of bees, game, and fish, and the monitoring of aerial crop dusting practices are among the tasks of the Service. In connection with the homologation and use of pesticides, plant samples are taken from pesticide treated fields at different dates after treatment. These samples are analyzed to determine the optimal pre-harvest treatment date to ensure the lowest possible or most acceptable pesticide residue levels in the agricultural products.

80-0714. Unger, S. G. (Dev. Plann. & Res. Assoc. Inc., Manhattan, KS 66502) **Environmental implications of trends in agriculture and silviculture. Volume II. Environmental effects of trends.** *US EPA Rep.* EPA 600/3-78-102 247 pgs.; 1978 (166 references).

This study assesses those trends in US agriculture and silviculture that will have the most significant environmental implications, in the short term (1985) and in the long term (2010). Volume I identifies trends in irrigated and nonirrigated crop production, feedlot production, range and pasture management, and silviculture and harvest management. Volume II identifies the major ecological impacts of the major trends on aquatic life, terrestrial life, and human health. The development of new biological and chemical pesticides is discussed. Developments involving micro-encapulated pesticides, systemic pesticides, surfactants for herbicides, biodegradable pesticides, alternative formulations, juvenile hormones, pheromones, sterile males, and predators and parasites are analyzed. Environmental factors, ecological effects, and research needs are considered. The second

volume also contains an assessment of prospective policy issues involving environmental quality management. Pesticide management is discussed. The control of residues through the control of waste and inputs is recommended. Methods suggested for control of inputs include bans on use, restricted use, and controlled rate of application of pesticides. (Author abstract by permission, modified)

80-0715. Metcalf, R. L.; Cole, L. K.; Wood, S. G.; Mandel, D. J.; Milbrath, M. L. (Inst. Environ. Studies, Univ. Illinois, Urbana, IL 61807) **Design and evaluation of a terrestrial model ecosystem for evaluation of substitute pesticide chemicals.** *US NTIS PB Rep.* PB-293,167: 298 pp.; 1979 (2 references).

This grant was established to design a terrestrial model ecosystem that was simple, inexpensive, and suitable for examining the total environmental fate of radiolabeled pesticides in a soil crop model e.g. soil-corn or soil-soybean. This was accomplished with the practical development of a system in which corn or soybeans are grown on 3 kg of typical Illinois soil types contained in a 19 l wide-mouth glass carboy fitted with airtight lid and impingers to sample pesticide content in aspirated air, and a bottom petcock to sample leachate water. The units are housed in an environmental growth chamber under 12 hr simulated daylight, at 26°C. Emphasis was placed on tracing the fate of the pesticide chemical and its degradation products in soil, air, water, phytoplankton and in the major food chain organisms of the model ecosystems, e.g. *Zea mays, Glycine max, Lumbricus terrestris, Limax maximus, Armadillidium vulgare, Estigmene acrea,* and, *Microtus ochregaster* in the soil-plant phase; and *Daphnia magna, Culex pipiens quinquefasciatus, Physa* spp., and *Gambusia affinis* in the leachate water. The ^{14}C-labeled pesticides examined included DDT, methoxychlor, aldrin, dieldrin, fonofos, phorate, parathion, methyl parathion, simazine, trifluralin, 2,4,5-T iso-octyl ester, hexachlorobenzene, pentachlorophenol (PCP), pentachloronitrobenzene (quintozene), and captan. Detailed summaries of their fate and degradation, based on more than 20,000 analyses, are presented. (Author abstract by permission)

80-0716. Surks, S. A.; Engler, R. M. (Army Eng. Waterways Exp. Stn., US Army, Viscksburg, MS) **Water quality impacts of aquatic dredged material disposal (laboratory investigations).** *US NTIS PS Rep.* PS-790,109 pg. 3; 1979.

Natural processes in aquatic ecosystems tend to concentrate heavy metals, chlorinated hydrocarbons, pesticides, nutrients, and oil and grease compounds in bottom sediments. These contaminants are not very soluble in water under the conditions that normally occur in oxygenated uncontaminated surface waters. Therefore, introducing high concentrations of these contaminants into aquatic ecosystems will generally result in an equilibrium condition where most of the contaminant will be sorbed (adsorbed and absorbed) by suspended particulate material and then deposited on the bottom when the suspended material settles. The time necessary to achieve the equilibrium condition depends upon the physicochemical conditions in the aquatic system and the quantity and duration of the contaminant introduction, Dredged Material Research Program (DMRP) reports and other literature indicate that dredging operations have the potential to temporarily mobilize or release some contaminants from the sediments. During disposal operations, the anaerobic sediments are mixed with aerated surface water, and a complex chemical interaction occurs. Heavy meals, such as cadmium, copper, chromium, lead, and zinc, are stabilized in the oxygen-free sediments as insoluble sulfides. [Abstract from Ecology of Insecticides Water Pollution.] (Author abstract by permission)

80-0717. Jackson, B. P. (Gulf Breeze Environ. Res. Lab., EPA, Gulf Breeze, FL) **Research review 1977.** *US NTIS PS Rep.* PS-790,109 pg. 6; 1979.

The report summarizes results of aquatic research conducted by the Environmental Research Laboratory, Gulf Breeze, Florida, Office of Research and Development. The research program examines the impact of pesticides and other organic compounds on marine species and communities, and seeks to develop new methodology for determining ecological hazards of chemical substances under simulated natural conditions. Projects are outlined under four categories: research related to toxicological testing; biological processes and effects; development of offshore oil resources; and Kepone (chlordecone) in the marine environment. Investigations conducted at the laboratory's Atlantic Coast field station at Bears Bluff, South Carolina, are also reviewed for the year 1977. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0718. Haghu, K. (Int. At. Energy Agency, Vienna, Austria) **Radiotracer study of the fate and persistence of organic fungicides used as seed dressing on grain. Part of a coordinated program of isotopic tracer aided studies of foreign chemical residues in food. Final report for the period 15 September 1972 - 29 February 1976.** *US NTIS PS Rep.* PS-790,109 pg. 12; 1979.

Radiotracer aided studies were made of the fate and persistence of thiram, used as a seed dresser, and ziram, used as a foliar spray, and their effects on soil fertility and plant growth. Thiram applied as a seed dresser had no inhibitory effect on (a) seedling height and rhizosphere microflora of barley, (b) soil microflora, (c) nodulation of cowpea plants. The uptake of ^{35}S radioactivity at 20-day stage was 0.3% of the total applied as ^{35}S thiram. Thiram as such was not present in barley or maize plants at any of the growth stages up to grain formulation

but was converted into DDC-glucoside, DDC-alamine, fungicide X and TTCA. The quantity of these decreased in barley and maize with time and were in negligible amounts at grain stage. The sulfur from thiram found its way into sulfur-containing metabolites like protein, amino acids, sulfolipids, etc. Ziram, a foliar spray fungicide was also converted into DDC-conjugates and the amounts of residue were negligible at harvest time both in rice and groundnut. Thiram degraded more rapidly in unsterilized soils than in sterilized soil, thus indicating biodegradation. The fungicide is more persistent in sandy than in laterite and alluvial soils. Microbial degradation of thiram was shown by comparing persistence of ^{35}S thiram in sterilized and unsterilized soils. A *Pseudomona* sp. isolated from soil was capable of degrading thiram and ziram and DDC-aminobutyric acid was the major polar metabolite. The appearance of similar degradation products with these dialkyl dithiocarbamates indicated that they have some common metabolic pathway. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0719. Olds, K. L. (Army Environ. Hyg. Agency. Aberdeen Proving Ground, MD) **Pesticide monitoring report. Department of the Army Pesticide Monitoring Program contrast of a 12-installation subset of the 1975 DA Pesticide Monitoring Program data to the 34-installation data.** *US NTIS PS Rep.* PS-790,109 pg. 13; 1979.

A 12-installation subset of the 34-installation 1975 DAPMP was evaluated to determine whether or not this 12-installation subset reflects the patterns observed from the 34 installations. The following findings were common in both the 12- and 34-installation data sets: differences in soil stratifications and the differences between top and bottom feeding fish. The differences in sediment stratifications observed in the 34-installation set were not confirmed in the 12-installation subsets. Interactions observed between fish and sediment were observed in both data sets and the transformed soil and sediment data sets. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0720. Malakhov, S. G.; Duttweiler, D. W. (Environ. Res. Lab., Athens, GA) **Symposium on environmental transport and transformation of pesticides: joint US - USSR project 02.03-31, forms and mechanisms by which pesticides and chemicals are transported.** *US NTIS PS Rep.* PS-790,109 pg. 15; 1979.

Under the USA-USSR Agreement on Cooperation in the Field of Environmental Protection, a joint project committee on environmental transport of agricultural chemicals (pesticides and fertilizers) sponsored a symposium on 20-27 October 1976 in Tbilisi, USSR. Papers were presented by American and Soviet scientists on the movement and transformations of pesticides in the atmosphere, in soils, in water, in plants, and in animals, and on the use of mathematical modeling to describe the transport and transformation of pesticides in the environment. Twenty-six papers encompassed reviews of the state of the art in each country and results of research on particular aspects of the topics. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0721. Smith, P. F.; Gilfillan, E. (Gloucester Mar. Stn., Massachusetts Univ., Gloucester, MA) **Ecological and aesthetic implications for the Merrimack Estuary of the Merrimack basin wastewater management alternatives.** *US NTIS PS Rep.* PS-790,109 pg. 21; 1979.

Physical and biological conditions of the Merrimack estuary and pollution abatement plan consequences are assessed. History and present status of the indigenous fish and shellfish populations are reported. Dams and upstream pollution have eliminated entire populations of migratory fish; sewage contamination of softshell clam beds has virtually destroyed a once-lucrative commercial fishery industry. High river pollution levels resulted from industrialization and population of riverbasin communities. Temperature, salinity, fecal coliform counts, pesticide residues, detergent content, nutrient and bacterial levels, dissolved oxygen flushing rate, and productivity are reported. Since the closing of many industrial mills, the estuary is at its best in 100 years; all present pollution results from upstream sewage effluence. Waterflow populations and habitats are described. Pollution abatement would significantly enhance esthetic and recreational values. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0722. Johnson, D. W.; Kent, J. C.; Campbell, D. K. (Water Resour. Res. Inst., Idaho Univ., Moscow, ID 83843) **Availability and concentration of pollutants from American Falls Reservoir sediments to forage and predaceous fishes.** *US NTIS PS Rep.* PS-790,109 pg. 46; 1979.

This publication reports on the predominant chlorinated hydrocarbons and heavy metal residues in American Falls Reservoir sediments, water and dominant rough and game fish. Chlorinated hydrocarbon residues (DDT metabolites, dieldrin, and PCB's) were found to vary with fish species and age. The mean value for PCB's in large suckers was 671 μg/kg in contrast to the EPA recommendation that it be no greater than 500 μg/kg. Mercury and cadmium were found in all species analyzed for those particular metals. Results indicate that the Food and Drug Administration's standard of 0.5 mg/kg may be exceeded in crappie, suckers, and large rainbow trout. The mean value for mercury in water was 0.9 μg/l. The maximum concentration of cadmium in the water was 7 times the value given by the National Academy of Sciences, considered to be an environmental threat. Arsenic was found

only in the sediments and water. It was not detected in any of the fishes sampled. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0723. Alexander, M. (Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Microbial degradation of pesticides.** *US NTIS PS Rep.* PS-790,109 pg. 55; 1979.

Microbial degradation of various organochlorine, organophosphorus and carbamate pesticides by aquatic and soil microorganisms was studied. Bacteria, fungi, and an alga (*Cylindrospermum* sp.) metabolized DDT to water-soluble products. DDT, DDA, and 2-chlorosuccinic acid were not detected: however; ,1-dichloro- 2,2-bis (*p*-chloro phenyl) ethane; 1,1-dichloro- 2,2-bis (*p*-chloro phenyl) ethylene, DDD (TDE); DDE, DDM (dichlorophen); DBH (BHC); DBP (dibutyl phthalate); and PCPA (4-CPA) were detected. The degradation of DDT metabolites yielded: DDM, DBH, and DBP from DDA; DBH and DBP from DDM; and DBH from DBP. Microorganisms were found capable of converting diphenylmethane, an analog of DDT, to 1,1,1′,1′- tetraphenyl dimethyl ether. *Pseudomonas putida* converted bis (*p*-chloro phenyl) acetic acid to bis (*p*-chloro phenyl) methane, 4,4′- dichloro benzhydrol and 4,4′- dichloro benzophenone by cometabolism. The organism also dehalogenated 4,4′-dichloro benzhydrol and 4,4′-dichloro benzophenone and converted diphenylmethane to benzhydrol and benzophenone as well as cleaving diphenylmethane and benzhydrol to phenylacetic and phenylglycolic acids, respectively. *Arthrobacter* sp. metabolized PCPA to 4-chloro- 3-hydroxyphenyl acetic acid. DDT and its breakdown products had no significant effect on respiration of microbial communities or algal productivity. The biodegradability of DDT analogs was related to their chemical structure. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0724. Josefsson, E.; Andersson, A. (Livsmedelslab. Staten Livsmedelsverk, S-75126 Uppsala, Sweden) **Provtagningsfel vid pesticidanalys av frukt och gronsaker. [Sampling errors in the analysis of pesticides in fruit and vegetables.]** *Var Foeda* 31(2): 103-109; 1979 (6 references).

The sampling errors that may occur in the analysis of pesticide residues in fruits and vegetables were studied in 2 lots of Australian tangerines, 2 lots of Italian grapes, 1 lot of lettuce from The Netherlands, and 3 lots of Spanish mandarins. Within the same lot, the samples (1.9 kg of tangerines, 1.5 kg of grapes, and 0.5 kg of lettuce) were taken from various boxes. The tangerines were analyzed for biphenyl, the grapes for DDT + DDD (TDE) + DDE, and the lettuce samples for quintozene + pentachloroaniline. The variance analysis of the analytical results shows significant differences in the pesticide residue levels between lots of tangerines and grapes. The mean residue levels (and confidence intervals) were found to be 89 ± 0.04 mg/kg and 0.02 ± 0.01 mg/kg for DDT + DDD + DDE in grapes (lots I and II, respectively), and 0.40 ± 0.04 mg/kg for quintozene + pentachloroaniline in lettuce. Small amounts of dicofol, endosulfan, ethion, trichloronate, fenitrothion, and carbophenothion were found in 1 lot of the Spanish mandarins. Malathion was also detected at slightly higher levels. Due to the variability of results in Spanish mandarin lots, statistical analyses were not performed on them.

80-0725. Zhukova, P. S.; Grimkova, T. E. (Beloruss. Nauchno-issled. Inst. Kartofelevod, Plodovshchevod., Minsk, USSR) **Prymyanenne gerbitsydau u pasevakh stalovykh karanyaplodau. [Use of herbicides in growing root crops for human consumption.]** *Vestsi Akad. Navuk B. SSR Ser. Sel'skagaspad, Navuk* (2): 83-86; 1979 (10 references) (Belorussian).

Herbicides were applied to beet and carrot plantings. Prometryne (1.5 kg/ha) was applied to carrot plantings and linuron (1.5 kg/ha), prometryne (1.5 kg/ha) or Dasanex (metoxuron; 3.0 kg/ha) were applied to the seedlings. The effect of the herbicides on the growth and development of the crop plants, and the nutritional content of the soil are described.

80-0726. Wang, J. Y. (Dep. Meteorol., San Jose State Univ., San Jose, CA 95192) **Effects of agrochemicals on weather and climate.** *Water Air Soil Pollut.* 12(1): 83-90; 1979 (17 references).

Interactions between agrochemicals and the environment are discussed. Alterations of radiant energy transfer, heat budget, and water balance at the interface of air and ground are considered. Among the weather and climate impacts of pesticides discussed are nucleation and condensation of moisture by pesticides sprayed from aircraft, evaporation and transpiration changes by oil-soluble pesticides, and alterations in radiation, temperature, air quality, and visibility. It is concluded that, in addition to the impact on micro-mesoscale weather phenomena and short term effects, global scale studies on sources, sinks, and residence periods of agrochemicals in the environment are needed.

80-0727. Banks, P. A.; Ketchersid, M. L.; Merkle, M. G. (Agron. Dep., Univ. Georgia, Athens, GA 30601) **The persistence of fluridone in various soils under field and controlled conditions.** *Weed Sci.* 27(6): 631-633; 1979 (5 references).

The concentration of fluridone [1-methyl-3-phenyl-5-[3- (trifluoromethyl)- phenyl]-4 (1H)- pyridinone] residue in Miller clay and Lufkin fine sandy loam was determined at various intervals following incorporated and nonincorporated applications in the field. Low levels of

fluridone were present in Miller clay after 250 days while up to 25% remained in Lufkin fine sandy loam 385 days after treatment. Incorporation of fluridone increased its persistence in Lufkin fine sandy loam but not in Miller clay. Fluridone degradation in Miller clay and Lufkin fine sandy loam was more rapid in the field than under controlled conditions. Fluridone degradation in sterilized Brennan fine sandy loam and Hidalgo sandy clay loam was significantly slower than in nonsterilized soil kept under the same conditions. These differences were not observed in Lufkin fine sandy loam and Miller clay. (Author abstract by permission)

80-0728. Jacques, G. L.; Harvey, R. G. (Dep. Agron., Univ. Wisconsin, Madison, WI 53706) **Persistence of dinitroaniline herbicides in soil.** *Weed Sci.* 27(6): 660-665; 1979 (15 references).

An oat (*Avena sativa* L. Dal) primary root bioassay procedure was used to study the persistence of eight dinitroaniline herbicides in soil. Sensitivity of the bioassay to the herbicides depended on the length of time roots were exposed to the herbicide treatments. Root inhibition increased with time of exposure. Herbicide persistence was studied under growth chamber, greenhouse, and field conditions. The herbicides remained biologically active the longest under dry and cool soil conditions. At 5°C, little change in herbicide activity was observed over an 8-month period. Under greenhouse conditions, the herbicides in wet soil dissipated rapidly, as compared with those in dry soil. Soil samples taken from depths of 0-7.5 cm and from 7.5-15 cm in the field showed that the herbicides were retained primarily in the surface 7.5 cm. Small amounts were found from 7.5-15 cm only shortly after the herbicides were applied. Dinitramine (N^4,N^4- diethyl-α,α,α- trifluro- 3,5-dinitro toluene- 2,4-diamine) was the only herbicide tested of which soil residues from spring field applications were not detected the following fall. (Author abstract by permission)

See also 80-0615, 80-0617, 80-0646, 80-0648, 80-0730, 80-0731, 80-0740, 80-0742, 80-0745, 80-0766, 80-0771, 80-0772, 80-0817, 80-0821, 80-0848, 80-0889 *and* 80-0898.

80-0729. Cotes, J. E. (MRC Pneumoconiosis Unit. Penarth, England) **Advances in respiratory protection.** *Ann. Occup. Hyg.* 22(2): 189-197; 1979 (4 references).

A review is presented of personal respiratory protection in occupational settings. Sources of respiratory hazard are discussed, as well as the fate of material inhaled into the lungs and the body's defenses against inhaled materials. In a discussion of the toxicological approach to defining the requirements for respiratory protection, some toxic responses to various chemical substances are listed. Examples of variable toxic responses to substances of different chemical classes are included in tabular form. The chemicals considered include organophosphates, carbamates, phosphine (aluminum phosphide), organic arsenicals, and sulfur dioxide. The acute effects of organophosphates include cholinesterase inhibition, while central and peripheral demyelination can be a delayed effect. Acutely, carbamates can result in hemolysis, and phosphine in pulmonary inflammation and central nervous dysfunction. Liver damage can be a short-term effect of organic arsenicals. The general requirements of a breathing apparatus for use in toxic atmospheres are described, along with the general components of the system, and new developments in air filtering systems and particulate filtration. Other topics covered include legal requirements for respirators, and United Kingdom standards for closed circuit compressed oxygen breathing apparatus.

80-0730. Carstensen, J.; Poulsen, E.; Tarding, F. (Inst. Toxicol., Natl. Food Inst., DK-2860 Soborg, Copenhagen, Denmark) **Evaluation of food safety national and international aspects.** *Arch. Toxicol.* (SPL1): 101-106; 1978.

Evaluation of the safety of chemicals in food have created considerable interest within the public, political, administrative, and scientific sectors in many parts of the world. Political and administrative approaches may vary from country to country depending on traditions and cultural pattern. The political aims and goals of our times may be clearly defined, but they are often rather obscure seen from a scientific point of view. Health authorities are supposed to interpret the political intentions and transcribe them into practical administration. The use, by national and international health authorities, of the available scientific and technological knowledge to evaluate the safety of the food in question is discussed. The ban of certain products, such as fish from areas where they are known to contain high levels of mercury or DDT, is mentioned. (Author abstract by permission)

80-0731. Munnecke, D. M. (Dep. Bot. & Microbiol., Univ. Oklahoma, Norman, OK 73019) **Hydrolysis of organophosphate insecticides by an immobilized-enzyme system.** *Biotechnol. Bioeng.* 21: 2247-2261; 1979 (10 references).

Experiments were carried out to develop an immobilized enzyme system capable of hydrolyzing residual pesticides in process wastewater before their discharge into waste treatment systems. The enzyme preparation, which was obtained from a mixed bacterial culture grown on parathion, was covalently bound to either porous glass or porous silica beads, and the enzyme immobilization was reaction carried out. The kinetics of parathion hydrolysis were examined at flow rates up to 96 *l*/hr and at influent substrate concentrations ranging from 10-250 mg/l. At least 95% of the parathion added to industrial wastewaters generated during its production was hydrolyzed by the enzyme reactor, which reduced the effluent parathion concentration to below 500 ppb. In 70-day laboratory continuous flow experiments conducted with industrial wastewater, there was no loss in immobilized enzyme activity. Also discussed are the influences of pH, temperature, solvents and detergents on enzyme stability and activity, and enzyme reactor kinetics.

80-0732. Raghavan, K. V. (Direct. Plant Prot. Quar. & Storage, Faridabad, India) **Pesticidal aspects of aerial spraying.** *Chem. Age India* 30(9): 839-844; 1979 (9 references).

The principles and objectives of pesticide spraying programs, equipment employed in spraying, and safety aspects of pesticidal use in India are discussed. Regulations dealing with pesticidal import, manufacture, sale, transport, and use are implemented and enforced by the Insecticides Act (1968) and the Insecticides Rules (1971). Summaries of the safe use and prevention of poisoning sections of these laws are presented.

80-0733. Singh, L. (Indian Standards Inst., New Delhi 110002, India) **Standardization in the field of pesticides.** *Chem. Age India* 30(9): 845-852; 1979.

Since 1955 the Indian Standards Institution has prepared specifications and standards for some 200 pesticides and their formulations. These standards cover insecticides (carbamates, organophosphates, and organochlorines), fungicides, herbicides, rodenticides, acaricides, fumigants, and seed dressing formulations, and are often revised to align their various requirements with statutory stipulations and newly developed technology. The Indian standards for 77 pesticides are included in tabular form. Indian Standard methods of testing pesticides and their formulations include determination of moisture content, specific gravity, melting point, and other physical properties. In addition, requirements for packaging, storage, stability, quality, disposal, and safety practices of pesticides have been established.

80-0734. Anonymous **Resolution conference examines 2,4,5-T safety.** *Farm Chem.* 142(12): 54-55; 1979.

Some observations made during the American Farm Bureau's Dispute Resolution Conference on 2,4,5-T are presented. One of the major conclusions of the conference was that retrospective epidemiologic studies have not shown phenoxy herbicides containing TCDD to be carcinogenic in humans. They state that 2,4,5-T has not been shown to be a carcinogen or mutagen in animal test systems studied to date. While TCDD is carcinogenic for rats and mice and is mutagenic in 2 bacterial reverse mutation systems, there have been no *in vivo* correlations of its mutagenicity. No adverse effect on human reproduction has been demonstrated. The conference concludes that there is no evidence for an abortifacient effect of TCDD in humans, and there are serious deficiencies in the Alsea OR study. In addition, there have been no manifest teratogenic effects following the accidental exposure to TCDD in Seveso, Italy. Except for accidental spills and waste disposal, there have been no levels of TCDD in the ppm or ppb range in the environment. The economic benefits of 2,4,5-T are also discussed.

80-0735. Dal Monte, P. R.; D'Imperio, N.; Biagini, G.; Giuliani Piccari, G.; Coccheri, S. (Serv. Gastroenterol. Osp. Magg. Sez. Bellaria, Bologna, Italy) **Indagini per la diagnosi precoce delle epatopatie toxxiche in una fabbica di antiparassitari dell'Emilia. [Investigations for early diagnosis of toxic liver disease in a pesticide factory in the Emilia region.]** *G. Clin. Med.* 60(8): 624-648; 1979 (51 references).

Clinical and laboratory investigations were made on 200 workers employed in a pesticide factory. In 30% of the subjects enlargement of the liver was noted. Changes in one or more of the laboratory parameters were noted in 40% of the subjects. Liver biopsies indicated steatosis (1 case), setatosis plus fibrosis (2 cases), and liver cirrhosis (1 cases). Ultrastructural changes noted by electron microscopic techniques are described. A program for prevention, early diagnosis, and therapy of occupational liver diseases is outlined.

80-0736. Watanabe, I.; Sakai, K.; Toyama, K.; Ueno, M.; Watanabe, M. (Sch. Ophthalmol., Hamamatsu Med. Coll. Hamamatsu, Shizyuoka, Japan) **[On three cases of ocular disturbance due to gramoxon, A herbicide containing 24% paraquat dichloride.]** *Ganka Rinsho Iho (Jpn. Rev. Clin. Opthalmol.)* 73(10): 1244-1246; 1979 (9 references) (Japanese).

Three cases of ocular disturbances by paraquat dichloride are described. In the first case, a 44-yr-old man splashed 24% paraquat dichloride in his left eye. He complained of hyperemia and foreign body sensations in his left eye. Visual acuities on his right and left eyes were 1.2 and 0.8, respectively, with strong conjunctival hyperemia and partly diffuse and superficial keratitis. The vestibule was transparent, but the lens and iris appeared normal. Epitherial exfoliation of the lower palpebral conjunctiva appeared on the 5th day, and formation of pseudomembrane on the same conjunctiva occurred on the 7th day. After 2 wk, however, only hyperemia of the lower eyeball and partial diffuse superficial keratitis remained without any difference of visual acuities. In the second case, a 50-yr-old man also splashed 24% paraquat dichloride into his right eye during dilution. Symptoms were the same as in Case No. 1. Strong hyperemia suggesting upper sclerosis with transparent cornea was diagnosed without abnormal findings in the fundus. On the 3rd day, diffuse superficial keratitis occurred. Epitherial exfoliation occurred on the 4th day on the same part as in case number 1. After 2 wk, formation of pseudomembranes was observed. After 3 wk, partial conjunctival hyperemia and slight keratitis remained without difference of visual acuities. In the third case, a 55-yr-old man splashed paraquat dichloride in his right eye. Ocular disturbances were similar to Cases 1 and 2. In this case, slight adhesion of the eyeball and eyelid remained.

80-0737. Anonymous **Air Force will study men who sprayed Agent Orange.** *J. Am. Med. Assoc.* 243(2): 102-103; 1980.

The US Air Force plans to study about 1200 men who sprayed Agent Orange, which may have been contaminated with 2,3,7,8- tetrachloro dibenzo-*p*- dioxin (TCDD), in Vietnam. The study is expected to take several years and will attempt to determine the long-term effects of TCDD exposure on human health. The VA has received more than 750 herbicide-associated compensation claims since late 1977, and more than 4800 requests for treatment. Complaints include sexual impotence, skin rashes, weight loss, depression, numbness, and birth defects in offspring.

80-0738. Eriksson, M.; Berg, N. O.; Hardell, L.; Moller, T. (Author address not given.) **Case-control-studie over maligna mesenkymala mjukdelstumorer och exposition for kemiska substanser. [Case control study of malignant mesenchymal soft-tissue tumors and exposure to chemical substances.]** *Lakartidningen* 76(4): 3872-3875; 1979 (10 references) (Swedish).

Relationships between exposure to chemical substances and malignant mesenchymal soft tissue tumors were studied in a case-control study of 329 subjects (110 patients with soft-tissue tumors and 219 matched controls). Exposure to phenoxy acid herbicides or chlorophenols was demonstrated in 22.7% of the patients and in 5.9% of the contols. The relative risk of malignant mesenchymal soft-tissue tumors was 5.1 after exposure to phenoxy acids or chlorophenols, or 4.7 after dissolution of the matching. In the 110 patients and the 219 matched controls, the respective frequencies of exposure were 21.8% and 11% for pesticides in general, 0.9% and 0.5% for amitrole, 1.8% and 0.9% for bromophos, 6.4% and 5% for DDT, 2.7 and

0.9% for dinoseb, 0.9% and 0.5% for fenitrothion, 8.2% and 4.6% for organomercurial seed-dressing agents, 0.9% and 0.5% for lindane, 0.9% and 0.9% for sodium chlorate, 2.7% and 0.5% for nicotine, and 13.6% and 6.8% for other pesticides. The soft-tissue sarcomas included leiomyosarcomas, malignant fibrous histiocytomas, liposarcomas, neurogenic sarcomas, angiosarcomas, fibromyxosarcomas, fibrosarcomas, dermato fibrosarcomas, atypical fibroxanthomas, synovial sarcomas, and other sarcomas. The findings indicate that exposure to phenoxy acids may be a risk factor of malignant mesenchymal soft-tissue tumors and that the risk factor applies not only to phenoxy acids containing polychlorinated dibenzodioxins and dibenzofurans but also to other phenoxy acids.

80-0739. Harding, W. C. (Author address not given.) **Pesticide profiles. Part 1: insecticides & miticides.** *MD Coop. Ext. Serv. Bull.* 267: 1-30; 1979.

Information on over 90 registered insecticides used in the state of Maryland is presented in tabular form. This information is presented to aid in selecting insecticides of value within specific pest management programs. The insecticides are listed alphabetically by their common or generic name. Since there are some products known best by their trade name, an alphabetized cross index for all trade names is provided. For each pesticide, the basic producers, chemical classification, formulations, and principal uses are given, along with the acute oral and dermal toxicity and the approximate residual period. A short description of the environmental hazards and the compatibility with other materials is also presented.

80-0740. Phadke, K. G.; Naim, M. (Div. Entomol., Indian Agric. Res. Inst., New Delhi 110012, India) **The role of honeybees in seed production in relations to use of pesticides.** *Pesticides* 12(9): 17-19; 1978 (26 references).

The effect of pesticide use on honeybees and the high toxicity of pesticides to honeybees is discussed. Carbamates, BHC, dieldrin, heptachlor, most fungicides, arsenic compounds, sodium fluoride, DNOC, parathion, malathion, lindane, and phorate are highly toxic to honeybees. Toxaphene, DDT, Thiodan (endosulfan), endrin, captan, ferbam, phenylmercury lactate, menazon, and bacterial pesticides are considered to be relatively safe. Schradan has been found to be non toxic to bees, but is a possible contaminant in honey. Bee mortality was found to reduce honey producion, seed production, and pollination efficiency. It was concluded that chemical control should be integrated with other management techniques to minimize the detrimental effects on honeybees.

80-0741. Gupta, R. C.; Shah, M. P.; Kashyap, S. K. (Natl. Inst. Occup. Health Meghajri Nagar, Ahmedabad-380016, India) **Studies on the pesticides users in urban areas - II. Domestic users.** *Pesticides* 13(9): 24-27; 1979.

In order to evaluate the knowledge of the urban family about household pests, the use of pesticides and safety hazards, 500 families in the Gujarat state in India were surveyed. The occupations, education and income status of the families sampled are listed. The pests most frequently encountered are cockroaches, mosquitos, and bed bugs. Only 2.6% of the families had not heard of pesticides, and 95.8% knew of the hazardous nature of pesticides. Those who used pesticides seldom or never were 16.3% of the group surveyed; 83.8% used pesticides sometimes or often. Two pesticides were used by 26.4% of the group, and 3 were used by 21.0%. Only 50% read labels and instructions, and only 16% use protective masks. Pesticides used included Finit (Flit), Tik-20, BHC, Baygon (propoxur), mercurials, and DDT. The reason for the limited use of pesticides by urban families and lack of specificity and knowledge are discussed. In addition, suggestions are made for raising the public consciousness in the area of pesticide use.

80-0742. Perold, J. G.; Bezuidenhout, D. J. J. (Dep. Intern. Med., Tygerberg Hosp. Parowvallei, South Africa) **Chronic organophosphate poisoning.** *S. Afr. Med. J.* 57(1): 7-9; 1979 (14 references).

Organophosphate poisoning due to long term low concentration exposure was observed in 38 persons at an agricultural college. It was suggested that organophosphates [Lebaycid (fenthion), malathion, and unidentified organophosphates] from gardens, vineyards and fruit orchards in the area were distributed by the wind, and that poisoning occurred through the skin. Symptoms observed included diarrhea (all patients), weight loss (> 50% of patients), reduced plasma pseudocholinesterase activity (mean = 2.3 kU/l for white patients; 2.72 kU/l for black patients), dyspnoea (28.9% of patients), muscle fasciculation, muscle cramps, muscle weakness, anxiety and depression. It was recommended that safety precautions for the the use of organophosphate pesticides be followed more closely.

80-0743. Candel, R.; Morales, A.; Gonzalez, C.; Cardenas, J. M. (Ser. Hematol. & Hemoterapia, Ciudad Sanit. Seguri. Soc. Virgen de la Arrixaca, El Palmar, Murcia, Spain) **Aspectos clinicos y hematologicos de la agranulocitosis. [Clinical and hematological aspects of agranulocytosis.]** *Sangre* 24(5B): 828-835; 1979 (44 references) (Spanish).

Agranulocytosis was diagnosed in 33 patients (23 men and 10 women). Common symptoms included fever, oropharynx affections, and malaise. Skin rash was observed in 12% of the cases. Hypocellularity of bone marrow was found in 20 patients. Thirty one of the patients had been taking one of the various drugs capable of producing

granulocytopenia such as aminopyrene, pyrazolones, paracetanol, diuretics, antithyroids, tranquilizers, anticoagulants, anticonvulsants, arsenicals, gold salts, oral antidiabetics sulfamides, and antibiotics. One patient had a history of lung cancer. One patient worked with herbicides as a fumigator. Etiological investigation found pyrazolone derivatives to be the cause of 66.7% of the cases. Death occurred in 12% of the cases (due to pneumonia in 1 case, Gram-negative sepsis in 2 cases, and massive intestinal necrosis in the remainder).

80-0744. Shirakawa, M.; Yamaguchi, T.; Fukamachi, S.; Sugata, S. (Sch. Hyg., Miyazaki Med. Coll., Miyazaki, Japan) **[Results of a mass survey of inhabitants in a southern district of Miyazaki Prefecture. II. Status quo of farmer's disease and intoxication due to pesticides.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 21(4): 637; 1979 (Japanese).

A survey was carried out by medical examination and questionnaire on 254 men and 516 women of age 30-69. Farmers comprised 78% of the samples. "Farmer's disease" was diagnosed in 12.3% of farm women, the highest percentage found among any group. The incidence was high in persons of age 40, and 40-50% of those surveyed had symptoms of the disease. Lumbago, rheumatism and hypertension were the most common illnesses. Nine cases of pesticide poisoning occurred prior to 1973, but no cases were noted after 1974. The overall rate of patients suffering from "farmer's disease", not including the pesticide intoxication cases, was 9%. The most frequently used pesticides were noted to be fenitrothion, carbaryl, iron methanearsonate, 2-*sec*-butyl phenyl *N*-methyl carbamate (BPMC), and malathion.

80-0745. Suta, B. E. (Cent. Resour. & Environ. Syst. Stud., Stanford Res. Inst., Menlo Park, CA) **Human population exposures to mirex and Kepone.** *US NTIS PS Rep.* PS-790,109 pg. 7; 1979.

Human exposures to mirex and Kepone (chlordecone) are assessed in this study. Three major paths of exposure are examined: ingestion through the food chain, inhalation of atmospheric mirex and Kepone, and exposure through drinking water. Exposure through the food chain appears to be the most pressing current problem. Various species of commerically caught fish in certain areas of the country have been found to contain slight amounts of the compounds. It is difficult to obtain estimates of the human exposure from sport fish, but evidence seems to suggest that sportsmen and their families may be exposed through fish. Also, game captured in the southeastern US has been found to contain the compounds. Kepone has been found in mothers' milk in some areas of the country. Atmospheric exposures are not considered terribly great now, since the compounds are no longer produced and the major atmospheric exposures are believed to be occupational exposure at the producing factory and exposure to workers' families from clothing, etc. Human exposure to mirex and Kepone from drinking water supplies does not appear to be a problem, since both compounds are very insoluble in water. Exposure through tobacco was also considered. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

See also 80-0608, 80-0610, 80-0615, 80-0713, 80-0756, 80-0766, 80-0773, 80-0774, 80-0797, 80-0817, 80-0820, 80-0821, 80-0848 *and* 80-0860.

80-0746. Ames, B. N. (Biochem. Dep., Univ. California, Berkeley, CA 94720) **The detection and hazards of environmental carcinogens/ mutagens.** *ACS Symp. Ser.* 94: 1-11; 1979 (32 references).

In this review testing for the mutagenic and carcinogenic potentials of environmental chemicals is discussed, with emphasis on the *Salmonella* microsome test. The testing method is described, along with validation procedures. The test is currently detecting about 90% of organic carcinogens as mutants. It is pointed out that there has been a million fold range of mutagenic potency of carcinogens in the test, with 1,2-epoxybutane showing 0.006 revertants/nmole, aflatoxin B1 7,057 revertants/nmole, and furylfuramide (AF-2) 20,800 revertants/nmole. Applications of the *Salmonella* test, including detection of mutagenic impurities, are described.

80-0747. Varanka, I. (Biol. Res. Inst., Hungarian Acad. Sci., Tihany, Hungary) **Effect of some pesticides on the rhythmic adductor muscle activity of fresh-water mussel larvae.** *Acta. Biol. Acad. Sci. Hung.* 29(1): 43-55; 1978 (12 references).

Glochidiae of the fresh-water mussel *Anodonta cygnea* L. were exposed to various pesticides, including Bi-58 EC (dimethoate), Novenda (AI DNOC), malathion, Shell-DD (D-D) Dikonirt (AI 2,4-D) and pure 2,4-D. When used at concentrations ≥ 0.1 g/l, these chemicals caused a slight, short excitatory response in the spontaneous rhythmic adductor activity of larvae. Some specimens exhibited lasting closure. The TA-induced adductor activity was inhibited at lower concentrations. It was suggested that with prolonged exposure time the threshold of inhibitory concentrations may be lower.

80-0748. Ignatov, G.; Grigorov, I.; Spasov, G.; Mircheva, T.; Dimova, S. (M. Popov Inst. Plant Physiol., Bulgaria) **Vliyanie na nyakoi fungitsidi vurkhu dikhatelnata aktivnost na pleseni ot pametnitsi na kulturata. [Influence of certain fungicides on the respiratory activity of molds isolated from cultural monuments.]** *Acta Microbiol. Bulg.* 1: 39-48; 1978 (3 references) (Bulgarian).

The effects of quaterol (dodecylpyridinium benzyl chloride; 1-250 $\mu g/cm^3$) and pentachlorophenol (PCP; 330-1980 $\mu g/cm^3$) on the respiration of the soil microorganisms *Aspergillus* and *Penicillium* sp., isolated from monuments, were studied in cultures. For some strains the respiratory activity decreased linearly with increasing fungicide concentrations. The respiration of other strains was stimulated by low fungicide concentrations and then was progressively inhibited by increasing concentrations. In these cases the respiratory activity dropped below the control values only at very high fungicide concentrations.

80-0749. Shabanov, M.; Toshkov, A.; Kovaldzhieva, G. (Inst. Microbiol., Bulgarian Acad. Sci., Sofia, Bulgaria) **Vliyanie na pestitsidite agriya 1060 A i neguvon na shtamove *Staphylococcus aureus*. [Effects of the pesticides Agria 1060A and Neguvon on *Staphylococcus aureus*.]** *Acta Microbiol. Bulg.* 2: 66-73; 1978 (6 references) (Bulgarian).

The effects of 0.5-72 hr incubation with Agria 1060 A (0.175-17.5 mg/cm^3) and Neguvon (trichlorfon, 0.125-1.0 mg/cm^3) of *Staphylococcus aureus* on the plasma-coagulating, hemolytic, proteolytic, and lecithinase activities, as well as on the antibiotic sensitivity and virulence of the isolated substrains were studied. The high pesticide concentrations were found to be bacteriostatic, while the lowest concentrations had a stimulating effect. The substrains isolated over different periods of time after the pesticide treatment manifested higher plasma-coagulating activity compared with the initial strain. The hemolytic activity disappeared completely as the pesticide dose increased. There were no significant changes in the proteolytic and lecithinase activities. The substrains had a higher resistance to some antibiotics (penicillin, oleandromycin, erythromycin, and lyncomycin) than the initial strain. No significant differences were found in substrain virulence compared with the initial strains.

80-0750. Koller, L. D. (Vet. Med., Univ. Idaho, Moscow, Idaho) **Effects of environmental contaminants on the immune system.** *Adv. Vet. Sci. Comp. Med.* 23: 267-295; 1979 (114 references).

Indirect toxicity of environmental contaminants due to alteration of the immune response is reviewed. Particular emphasis is given to the effects of DDT due to its persistence in the environment and accumulation in animal tissues. Animals which have been exposed to DDT are frequently found to be more susceptible to infectious organisms than are those animals without this exposure. Occasional inhibition of antibody response in animals previously exposed to DDT has been noted. A decrease in the numbers of plasma cells in popliteal lymph nodes has been observed following DDT exposure, as well as reduced germinal centers in the spleen and an inhibited skin sensitivity to tuberculin in rabbits. Other contaminants briefly mentioned in this review include heavy metals, industrial chemicals (PCBs, TCDD), and the pesticides lindane, Sevin (carbaryl), dicresyl, Jalan, Tillam (pebulate), maneb, methylnitrophos (fenitrothion), chlorophos (trichlorfon), warfarin, heptachlor, propanide (propanil), mirex, carbofuran, Anthio (formothion), milbex, Carbamine, and paraquat.

80-0751. Johansen, C. (Washington State Univ., Pullman, WA 99164) **Bee poisoning survey.** *Am. Bee J.* 119(4): 315,318; 1979.

Results of a survey concerning the effects of

microencapsulated (ME) methyl parathion on honeybees are presented. Replies to questionnaires from 32 States, the District of Columbia, and Puerto Rico showed that ME (methyl parathion) is highly toxic to bees. It was concluded that residual amounts of the pesticide in autumn-stored pollen in beehive frames can often lead to bee colony collapse the following spring.

80-0752. Hall, J. G.; Pauli, R. M.; Wilson, K. M. (Div. Med. Genet., Child. Orthop. Hosp. & Med. Cent., Seattle, WA 98105) **Maternal and fetal sequalae of anticoagulation during pregnancy.** *Am. J. Med.* 68(1): 122-140; 1980 (167 references).

This review considers the effects of coumarine derivative exposure to the fetus. About one third of liveborn morbidity following such exposure was found to be due to warfarin embryopathy. All patients showing signs of embryopathy had been exposed during the week 6-9 of gestation. Various mechanisms by which warfarin may have its effect are suggested. An inhibition of post-translational carboxylation of coagulation proteins due to a molecular mechanism may occur. It is concluded that such inhibition could explain nasal hypoplasia, stippled calcification, extremity shortening and vertebral abnormalities.

80-0753. Elissalde, M. H., Jr.; Clark, D. E. (Vet. Toxicol. & Entomol. Res. Lab., Agric. Res. Sci. & Educ. Admin., USDA, College Station, TX 77840) **Testosterone metabolism by hexachlorobenzene-induced hepatic microsomal enzymes.** *Am. J. Vet. Res.* 40(12): 1762-1766; 1979 (31 references).

Experiments were carried out to assess the effects of the fungicide hexachlorobenzene (HCB) on the *in vitro* hepatic microsomal metabolism of testosterone in mice. Male ICR mice were given feed containing 0, 2.5, 25, or 250 mg HCB/kg for 21 days, at which time they were sacrificed, trunk blood collected, and livers removed and diced. Testicles, seminal vesicles, ventral prostate, brain and omental fat were excised and weighed. Hepatic microsome suspensions were prepared and NADPH cytochrome *c* reductase activity, P-450, and cytochrome b_5 concentrations determined. Serum testosterone was measured by radioimmunoassay, and residues of HCB in adipose tissue, brain, liver and feed were measured by electron capture gas-liquid chromatography. In order to study *in vitro* testosterone metabolism, microsomal fractions were incubated with 1,2-(^{3}H)testosterone for 10 min, and, after drying, were analyzed by thin-layer chromatography and liquid scintillation counting. In mice fed 250 mg/kg, there were significant increases the mean liver weight, hepatic microsomal protein, cytochrome P-450, cytochrome b_5, and cytochrome *c* reductase activity. There were also significant increases in the *in vitro* metabolism of (^{3}H)testosterone, and decreases in the serum concentrations of testosterone and in the weights of seminal vesicles and ventral prostate. It is concluded that HCB has a profound effect on the homeostatic mechanism which controls the serum testosterone concentrations in the mouse.

80-0754. Yamada, S.; Okudaira, H.; Hayashi, E. (Dep. Pharmacol., Shizuoka Coll. Pharmaceut. Sci., Shizuoka 422, Japan) **An alteration in sensitivity to cholinergic agents on guinea-pig ilea and atria after repeated administration of an organophosphate and an antagonism by a carbamate.** *Arch. Int. Pharmacodyn. Ther.* 241(1): 32-44; 1979 (20 references).

Experiments were designed to quantify the alteration in the sensitivity to cholinergic agonists on the ilea and atria from guinea pigs treated chronically with the organophosphorus insecticide propaphos. Male guinea pigs were given daily oral sublethal doses (5 mg/kg/day) of propaphos for 7 days, with 1 group receiving a sublethal dose (25 mg/kg/day) of the carbamate insecticide 2-sec-butylphenyl-N- methyl carbamate (BPMC) 25 min prior to the propaphos treatment. The animals were sacrificed 12 hr after the last administration and the atria and ilea were removed and exposed to the cholinergic agents acetylcholine (ACh), carbachol (CCH) and nicotine. With the ilea, contractile responses were recorded and the ED50 and ED80 (the values which are the concentration of agonists necessary to produce 50% and 80% of the response to KCl), were determined. In experiments on the isolated atria comparison of sensitivity was based on the ID50 value, the concentration of cholinergic agent necessary to produce 50% inhibition of spontaneous responses. The response of the 2 tissues to ACh was significantly enhanced by propaphos, while the response to CCH was unaffected. The ED50 and ED80 values for the responses to ACh and nicotine were significantly decreased by propaphos, while the values pertaining to CCH were significantly increased. The alteration in the responsiveness of the tissues to ACh, CCH and nicotine produced by propaphos treatment was significantly reduced by BPMC pretreatment. It is suggested that this alteration in the sensitivity of the atria and ilea to cholinergic agents may be due to changes in synaptic ChE activity.

80-0755. Clampitt, R. B. (Wellcome Res. Lab., Berkhamsted, Herts HP4 2QE, England) **An investigation into the value of some clinical biochemical tests in the detection of minimal changes in liver morphology and function in the rat.** *Arch. Toxicol.* (SPL1): 1-13; 1979 (38 references).

Minimal liver damage was induced in groups of rats by the administration of three toxicants, carbon tetrachloride, sodium phenobarbitone and orotic acid. Serial blood samples were taken from the animals during the course of the experiment and the plasma levels of a number of enzymes, substrates and metabolites were

measured. Liver and kidney samples were also taken at appropriate times after dosing and examined histologically for evidence of drug-induced damage. No single test gave unequivocal evidence of liver damage for all three compounds. The conventional liver function tests, alanine transaminase, aspartate transaminase, and alkaline phosphatase, whose plasma activities are usually reported in toxicity studies, were not the most sensitive indicators of the minimal liver cell damage caused by the drugs used in this experiment. Knowledge of the intracellular location of the diagnostic enzyme makes it possible to describe, at least in part, the nature of the changes within the liver. Measurement of plasma cholesterol and triglyceride levels can provide information about disruption in lipid metabolism. The times at which blood samples are taken are most important if transient drug effects on the liver are to be detected. (Author abstract by permission)

80-0756. Poulsen, E. (Inst. Toxicol., Natl. Food Inst., DK-2860 Copenhagen, Denmark) **Toxicological aspects of food safety. Introduction to the symposium.** *Arch. Toxicol.* (SPL1): 15-21; 1978 (13 references).

In this field of toxicology the main emphasis is placed on establishing the safety of the food more than on specific studies of toxic effects. Studies on potential long-term effects are of particular importance. The 3 important items in relation to food toxicology are: natural food components, food additives, and food contaminants. In this latter area further compounds such as mycotoxins and monomers from food packaging materials also merit considerations. The symposium discusses pharmacokinetic and metabolic studies and the significance of induction phenomena. In relation to the lecture on mutagenicity and carcinogenicity some considerations are given to screening methods. A short account is given of the toxicological principles used as a basis for the estimation of an acceptable daily intake for man (ADI). The problems related to interaction between compounds (drugs, food additives and contaminants) and their interaction with diet are important and need consideration. In studies in relation to food safety one will continue to depend on the now employed toxicological methods. However, in our aspirations to achieve improved and longer lasting predictions there is a need to establish a more basic understanding of the effect of food chemicals on the mammalian organism and of the effect of the organism on the chemicals. (Author abstract by permission)

80-0757. Karlog, O.; Nielsen, P.; Rasmussen, F. (Dep. Pharmacol. & Toxicol., Royal Vet. & Agric. Univ., DK-1870 Copenhagen, Denmark) **Toxicokinetics.** *Arch. Toxicol.* (SPL1): 55-67; 1978 (13 references).

The absorption, distribution, and elimination of toxic compounds can be described by means of kinetic parameters such as those used in pharmacology. Administration of toxic doses may lead to changes in some of these parameters. The toxic effect may further influence the known parameters of some test substances. Toxicokinetic parameters will be described using examples from two groups of compounds: naturally occurring toxic compounds and synthetic compounds. Changes in elimination parameters caused by toxic substances will be demonstrated a.o. the effect of long term intake of ochratoxin A and methoxyethyl mercury (MEMC) on the kidney function in swine. In both examples are demonstrated a pronounced reduction in the clearances of inulin and *p*-aminohippuric acid. Furthermore, an elucidation of concentration dependent changes in enzyme activity and changes in metabolism of pesticides will be given. As examples alkylphosphates (malathion, parathion and methyl parathion) and dinitrophenols (DNOC and dinoseb) in domestic animals will be used. (Author abstract by permission)

80-0758. Lewerenz, H. J.; Plass, R. (Akad. Wiss. DDR, Forschungszent. Molekularbiol. & Med., Zentralinst. Ernahrung, DDR-1505 Bergholz-Rehbrucke, DDR) **Effect of ethylenethiourea on hepatic microsomal enzymes in the rat.** *Arch. Toxicol.* (SPL1): 189-192; 1978 (5 references).

Ethylenethiourea (ETU) is a degradation product of the ethylenebisdithiocarbamate fungicides. The effect of ETU on microsomal enzymes was studied by measuring the hexobarbital sleeping time of male and female rats after administration in single oral doses of 20, 50, 100 and 200 mg/kg, or in the diet at levels of 200 and 300 ppm and by determining the aminopyrine- *N*- demethylase and aniline hydroxylase activit in livers of male rats given single oral doses of 20, 50, 100 and 200 mg/kg. ETU increased the sleeping time at all dose levels one day after single exposure, but the increase was significant only with 50, 100, and 200 mg/kg in males and 200 mg/kg in females. Three days after treatment the sleeping time at all doses was decreased to values not significantly different from controls. In males fed a diet containing 200 ppm ETU the sleeping time increased gradually with time of treatment. The sleeping time of females showed an initial increase, having a peak at 3 weeks and approximately the same values over the subsequent feeding period. All doses used in the single treatment studies caused an initial inhibition of the aminopyrine-N-demethylase and aniline hydroxylase activities in livers of male rats, followed by a dose-related increase. The inhibition of the aniline hydroxylase activity was statistically significant only at doses of 50 mg/kg and higher. (Author abstract by permission)

80-0759. Kobayashi, Y.; Okahata, S.; Usui, T. (Dep. Pediatr., Sch. Med., Univ., Hiroshima Hiroshima 734, Japan) **Hemolysis of human erythrocytes by paraquat in relation to superoxide dismutase activity.** *Biochem. Biophys. Res. Commun.* 91(4): 1288-1294; 1979 (19 references).

Paraquat, a widely used herbicide, induced hemolysis of human erythrocytes in hypotonic saline solution. The degree of hemolysis depended on the intracellular superoxide dismutase level. Erythrocytes with higher enzyme activity were more sensitive to paraquat, and those depleted of superoxide dismutase by diethyldithiocarbamate were more resistant. This apparent paradox was interpreted to be due to a rapid turnover of the enzymic dismutation reaction with a resultant increase in the generation of the reactive species responsible for hemolysis. Studies with various scavengers suggested that the hemolytic agent is singlet oxygen. No definite evidence for lipid peroxidation could be demonstrated in erythrocytes exposed to paraquat. (Author abstract by permission)

80-0760. Ross, W. E.; Block, E. R.; Chang, R. Y. (Univ. Florida Coll. Med., Gainesville, FL 32610) **Paraquat-induced DNA damage in mammalian cells.** *Biochem. Biophys. Res. Commun.* 91(4): 1302-1308; 1979 (17 references).

The possibility that paraquat (PQ) may exert its toxicity by inducing DNA damage was examined. Mouse lymphoblasts in culture exhibited inhibition of colony forming ability, and DNA single strand breaks following a 2 hr exposure to PQ. These phenomena are dose dependent and increase when a rat liver S9 fraction is included in the incubation mixture. The presence of superoxide dismutase and catalase did not prevent the effects of PQ. These data indicate that DNA should be considered as a possible macromolecular target for the lethal effects of paraquat. (Author abstract by permission)

80-0761. Siddons, R. C.; Evans, R. T.; Beever, D. E. (Grassl. Res. Inst., Maidenhead, Berkshire SL6 5LR, England) **The effect of formaldehyde treatment before ensiling on the digestion of wilted grass silage by sheep.** *Br. J. Nutr.* 42(3): 535-545; 1979 (41 references).

Wilted perennial ryegrass was stored either without additive or after adding a mixture of equal volumes of formic acid and formalin at a rate of 35 g formaldehyde/kg herbage crude protein. In cases where the additive was used, a marked reduction in carbohydrate fermentation and protein degradation was noted in the stored ryegrass. When urea or urea plus soybean meal was used to supplement the treated silage, a significant increase in the amount of food N degraded in the rumen and rumen ammonia levels were noted. The study demonstrated that the use of formaldehyde with formic acid as a silage additive can result in increased amounts of amino acid available to the ruminant animals. The amount of formaldehyde added, however, must be carefully controlled. Too much added can mean that the silage protein is protected to such an extent that microbial growth in the rumen or protein digestion in the small intestine is adversely affected.

80-0762. Jones, C. L.; Jennison, R. F.; D'Souza, S. W. (St. Mary's Hosp., Manchester M13 OJH, England) **Bacterial contamination of expressed breast milk.** *Br. Med. J.* 2(6201): 1320-1322; 1979 (7 references).

Breast milk was donated by mothers who had recently given birth. The milk was stored in 1% hypochlorite sterilized bottles. Standard pasteurization procedures were carried out to study the possible loss of, or damage to certain protective substances in the milk such as IgA and lactoferrin brought about by the pasteurization sequence. It was determined that heating the milk at 62.5°C for 5 min was sufficient to destroy over 90% of *Escherichia coli, Staphylococcus aureus,* and group B B-hemolytic *Streptococci* inoculated into the milk samples. The study also indicated that the hypochlorite solution adhering to the inner walls of the storage containers was responsible for a reduction in bacterial counts in the milk samples. No side effects in the baby due to using hypochlorite solution were found. It was suggested that the possibility of hypochlorite solution altering the important protective substances in breast milk should be investigated further.

80-0763. Kolodziejczyk, A.; Kolodziejczyk, E. (Res. Inst. Pestic. Side-Effects, Inst. Org. Chem. Ind., 43-200 Pszczyna, Poland) **Badania toksycznosci ostrej gamakarbatoxu M zawiesinowego. [A study on acute toxicity of suspension Gamakarbatox M.]** *Bromatol. Chem. Toksykol.* 12(1): 39-42; 1979 (6 references) (Polish).

The acute toxicity of Gamakarbatox M (carbaryl) suspension was studied in warm-blooded laboratory animals. The acute oral LD50 of the aqueous suspension in the rat was found to be 1029.6 mg/kg; the cutaneous LD50 in rats was > 5000 mg/kg. The preparation was determined to have a low dermal toxicity and irritating effect in rats and rabbits. It did, however, have an irritating effect on the rabbit eye.

80-0764. Murakami, M.; Fukami, J. I. (Inst. Phys. & Chem. Res., Wako, Saitama 351, Japan) **Incorporation of labeled pesticides and environmental chemicals into nuclear fraction of cultured human cells.** *Bull. Environ. Contam. Toxicol.* 24(1): 27-30; 1980 (10 references).

The incorporation of ^{14}C labeled 2,4-D, HCB (hexachlorobenzene), chlordimeform, parathion, dieldrin, aldrin, carbaryl, DDT, PCB and benzo(a)pyrene into human embryonic lung (HEL 299) diploid cells was measured. Concentration of the compounds (in 1% ethanol) was 4×10^{-6} *M* in 10 ml medium and the cultures were incubated at 37°C for 15 hr. Benzo(a)pyrene was incorporated at the highest rate, 318.8 ± 46.8 expressed as pmol/mg of nuclear protein. DDT (123.1 ± 12.6), carbaryl (96.1 ± 29.0), aldrin (54.9 ± 9.4), dieldrin (49.1 ± 3.0), and PCB (36.4 ± 2.7) were markedly present in the nuclear fraction. Parathion (4.8 ± 3.0), chlordimeform (4.4 ± 2.1) and HCB (3.5 ± 1.3) were only slightly incorporated. 2.4-D was

not detected. In other experiments no binding of dieldrin, aldrin, DDT or parathion to cellular DNA was found after incubation for 24 hr. It is suggested that incorporation of the labeled chemicals to the nuclear fraction may be the result of binding to the nuclear proteins.

80-0765. Singh, G. J. P.; Thornhill, R. A. (Dep. Zool. & Comp. Physiol., Univ. Birmingham, Birmingham B15 2TT, England) ***In vitro* metabolism of ^{14}C dieldrin and some of its metabolites in isolated nerve cords of *Blaberus discoidalis*.** *Bull. Environ. Contam. Toxicol.* 24(1): 73-80; 1980 (15 references).

Nerve cords were incubated in saline containing dieldrin or metabolites of dieldrin for periods of 48 hr at room temperature. The results demonstrated the formation of *cis*- and *trans*- andrindiol as a result of hydration of dieldrin in nerve cords. The formation of a third metabolite was also noted, which had not previously been reported. This new metabolite, M1, is further metabolized yielding *cis*- and *trans*- aldrindiol. The treated saline was found to contain all the metabolites present in the nerve cords, while the control saline contained only unmetabolized dieldrin. This suggests that the metabolites found in the saline were present due to *in vitro* enzymatic activity.

80-0766. Lavy, T. L.; Shepard, J. S.; Bouchard, D. C. (Dep. Agron., Univ. Arkansas, Fayetteville, AR 72701) **Field worker exposure and helicopter spray pattern of 2,4,5-T.** *Bull. Environ. Contam. Toxicol.* 24(1): 90-96; 1980 (9 references).

Human exposure data was gathered from individuals involved in spraying low volatile ester formulations of 2,4,5-T (2 lb AI/A; 2.26 kg AI/ha) with helicopter, tractor, and backpack sprayers. Monitoring of respiratory exposure was done by face mask respirators, however, interference on analysis prevented actual determinations. Six 100 cm^2 gauze patches/person were used to determine external exposure. Helicopter crews (5 men) received generally low levels of exposure. The mixer of the mist blower crew received considerably more exposure than did his fellow workers. For helicopter crews the external exposure values ranged from 0.0036 to 0.0136 mg/kg. Values for mist blower crews (4 men) were from 0.046 to 0.205 mg/kg. For backpack spray crews (12 men) the range was 0.081-1.85 mg/kg. The exposure of the tractor driver (1 man) was 0.046 mg/kg. To determine the maximum exposure from being in an area being sprayed with 2,4,5-T, one individual stood directly under the helicopter spray path. Direct field spray exposure was 0.01-6.48 mg. When an individual walked through a sprayed area 2 hr later, no detectable 2,4,5-T was found at a sensitivity level of 10 μg. Drift of 2,4,5-T from the helicopter spray was measured at 0, 80, 160, 320, 640 and 960 ft (0, 24, 48, 96, 192 and 288 m). One sample collected at 960 ft had detectable (0.01 mg/collection pad) levels of 2,4,5-T.

80-0767. Nath, M.; Venkitasubramanian, T. A.; Krishnamurti, M. (Dep. Chem., Hans Raj Coll., Univ. Delhi, Delhi 110007, India) **Action and structure- activity relationship of rotenoids as inhibitors of respiration *in vitro*.** *Bull. Environ. Contam. Toxicol.* 24(1): 116-123; 1980 (21 references).

Liver slices from Wistar strain male rats were placed in flasks containing Krebs-Ringer solution, glucose, and one of 5 rotenoids at pH 7.4. Rotenoids were isolated from *Pachyrrhizus erosus* seeds, rotenone, dolineone, pachyrrhizone, 12a-hydroxy dolineone, and 12a-hydroxy pachyrrhizone. The rotenoids significantly inhibited respiration by rat liver slices when glucose was used as the substrate. Rotenone inhibited oxygen consumption to the greatest extent, 3.45 ± 0.30 μl O_2/mg dry tissue/hr compared to 7.81 ± 0.45 in controls. Rotenone at 2 x 10^{-6} M was also significantly inhibitory of rat liver mitochondria oxygen consumption and glutamate oxidation. A discussion of the compound structure as related to the inhibition activity is presented.

80-0768. Batey, B. H.; Wells, M. R. (Middle Tennessee State Univ., Murfreesboro, TN 37130) **Effects of *p,p'*-DDT, *p,p'*-DDD, and *p,p'*-DDE on oxygen uptake in the freshwater planarian (*Phagocata gracilis*).** *Bull. Environ. Contam. Toxicol.* 24(1): 128-133; 1980 (5 references).

To determine the toxic effects of DDT and its degradation products, starved planarians (*Phagocata gracilis*) were given beef liver perfused with corn oil containing 10 ppm *p,p'*-DDT, *p,p'*-DDE, or *p,p'*-DDD (TDE). No symptoms of DDT poisoning or DDT-related mortality were noted in the organisms exposed to these substances for 60 min periods. Oxygen uptake was significantly increased in the planarians fed beef liver alone. There were no significant differences over a 96 hr period between the oxygen uptake in planarians fed beef liver perfused with DDT, DDE, or DDD in corn oil an planarians fed beef liver perfused with corn oil alone. Possible reasons for the absence of a toxic effect of DDT to planarians, including the presence of a detoxifying microsomal enzyme system and the non-accumulation of DDT in the organisms, are reviewed.

80-0769. Flannagan, J. F.; Townsend, B. E.; De March, B. G. E. (Freshwater Inst., Environ. Canada, Winnipeg, Manitoba R3T 2N6, Canada) **The effects of an experimental injection of methoxychlor on aquatic invertebrates: accumulation, standing crop, and drift.** *Can. Entomol.* 111(1): 73-89; 1979 (24 references).

The impact of a methoxychlor blackfly larvicidal program on non-target aquatic invertebrates of the Athabasca River, Alberta, was investigated using 786 l of 24% ec methoxychlor. Application was at a rate calculated to give a 15 min pulse of 300 μg methoxychlor/l.

Catastrophic drift on non-target invertebrates, especially Ephemeroptera, Trichoptera, and Plecoptera, followed by large decreases in both drift and standing crop occurred to a distance of 400 km downstream. All non-target organisms, regardless of trophic level, appeared to be affected at about the same time. Methoxychlor levels well above ambient water levels were recorded in most invertebrate species. It is suggested that methoxychlor is not selective for blackfly larvae, and that the pesticide accumulates in natural invertebrate populations.

80-0770. Ali, A.; Hall, R.; Fletcher, R. A. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario NIG 2W1, Canada) **Inhibition of fungal growth by plant growth retardants.** *Can. J. Bot.* 57(4): 458-460; 1979 (9 references).

Three plant growth retardants, ancymidol, amitrole, and Phosfon-D (chlorphonium), which interfere with the isoprenoid pathway in plants, were tested for their ability to inhibit growth of 9 fungi. Inoculum plugs containing 1 of the fungi were incubated in agar culture media containing various concentrations of the growth retardants. The ED50 (concentration required to cause 50% inhibiton of mycelial growth) was calculated. In a second experiment, fungal growth and seed germination were observed in barley seeds infected with the fungus *Bipolaris sorokiniana* and soaked in an aqueous solution of ancymidol before being incubated on culture media. Results indicated that 5 fungi were highly sensitive to ancymidol (ED50 of less than 50 mg/l), and a different set of 5 was highly sensitive to amitrole. The growth of 7 fungi was inhibited by 50% at concentrations of Phosfon-D of less than 300 mg/l. A solution of 100 mg ancymidol/l prevented growth of *B. sorokiniana* from infected barley seeds and inhibited seedling growth. It is suggested that if inhibitors of isoprenoid synthesis can inhibit growth of plants and fungi, they can inhibit other organisms, and may be broad spectrum biocides.

80-0771. Shrivastava, K. N.; Singh, K. P.; Srivastava, B. P. (Agric. Prod. Div., Union Carbide India Ltd., Bhopal (MP), India) **Temik 10G (aldicarb) - a versatile systemic granular pesticide.** *Chem. Age India* 30(9): 853-858; 1979 (30 references).

The chemical properties, application methods, efficacy, and metabolism and residues in living systems of 10% granular formulations of Temik 10G (aldicarb) are reviewed. Toxicity studies have shown that dermal LD50 values to albino rats are over 4000 mg/kg, and that the pesticide is easily degraded to non-toxic metabolites in mammalian systems. Temik 10G is safer to agricultural workers than other commonly used granular pesticides, and is much safer than most EC formulations. Temik 10G is biodegradable and is not hazardous to the environment, beneficial insects, or wildlife.

80-0772. Greenberg, C.; Davies, S.; McGowan, T.; Schorer, A.*; Drage, C. (VA Med. Cent., Minneapolis, MN 55417) **Acute respiratory failure following severe arsenic poisoning.** *Chest* 76(5): 596-598; 1979 (6 references).

The case history of severe respiratory failure after acute intoxication with arsenic is reported. A 47-yr-old farmer was admitted after handling insecticides, although the exact cause of the poisoning could not be determined. After initial symptoms of nausea, acute psychosis, skin rash, and pancytopenia, a peripheral neuropathy developed, resulting in severe weakness of muscles. Five wk after poisoning the patient was no longer able to breathe on his own and required mechanical ventilatory support. Slow improvement followed and the man was weaned from the respirator after another 6 wk. Urine samples obtained upon admission had arsenic levels of 8.1 mg/l. Urinary arsenic levels were decreased to almost 0.6 mg/l 7 days later. The use of dimercaprol to treat acute arsenic poisoning, coupled with continuous close watch of the patient's neurological condition is recommended.

80-0773. Liddle, J. A.; Kimbrough, R. D.; Needham, L. L.; Cline, R. E.; Smrek, A. L.; Yert, L. W.; Bayse, D. D.; Ellington, A. C.; Dennis, P. A. (Clin. Chem. Div., Bur. Lab., CDC, US Dep. HEW, Atlanta, GA 30333) **A fatal episode of accidental methomyl poisoning.** *Clin. Toxicol.* 15(2): 159-167; 1979 (7 references).

Three fatalities from the accidental ingestion of methomyl, a carbamate pesticide, are reported. The methomyl had been stored in an unlabeled tin can and was accidentally used in preparing roti, an Indian dish. The identification of the source of the poison through animal tests and further chemical identification is described. The lethal dose of methomyl was estimated to have been between 12 and 15 mg/kg body weight. (Author abstract by permission)

80-0774. Anonymous **Organophosphate insecticide poisoning.** *Clin. Toxicol.* 15(2): 189-191; 1979.

An overview of organophosphate insecticide poisoning, including a list of common insecticides in this group, symptoms and mechanisms of organophosphate poisoning, and treatment, is presented. The organophosphate insecticides, which are absorbed through the skin from the conjunctiva, and from the respiratory and gastrointestinal tracts, inhibit both pseudocholinesterase and acetylcholinesterase. Symptoms of poisoning include bronchoconstriction, vomiting, bradycardia, hypotension, muscular twitching and weakness, anxiety, drowsiness, and coma. Treatment should first involve supporting respiration and decontamination of the clothes and skin if exposure is dermal. If the exposure is by ingestion, emesis should be induced if the patient is alert, and gastric lavage carried out if the pa-

tient is comatose. Atropine and pralidoxime can be administered, and the appropriate doses are discussed.

80-0775. Reddi, T. V. (Dep. Bot., Andhra University, Waltair, India) **Efficacy of dimethyl sulfoxide on the mutagenic action of diethyl sulfate on rice.** *Curr. Sci.* 48(12): 540-541; 1979 (4 references).

Studies were carried out on the mutagenic effects of diethyl sulfate (DES) in rice. Five hundred seeds of T (N) 1 and IR 8 varieties were presoaked in distilled water for 12 hr, then treated with 0.03, 0.05, and 0.1 concentrations (units not stated) of DES alone or in combination with 5% dimethyl sulfoxide (DMSO) for 12 hr. There were no marked differences between the 2 treatments in reduction in germination or in seedling survival in the M_1 generation. However, seedling height was increased in T (N) 1 following the combination treatment and in IR 8 following DES treatment only. When chlorophyll mutants were studied in the M_2 generation on a panicle basis, in T (N) 1 the same number of segregating lines were produced in both treatments, while in IR 8 there was a marked reduction with the combination treatment. When meiosis in M_1 plants was studied, the frequency of aberrant T (N) 1 plants was higher with the combination treatment (25.7%) than with the single treatment (18.0%); there were no aberrant plants detected in IR 8 strains. Due to these varietal differences it is concluded that a closer study is required on the usefulness of DMSO for increasing the mutagenic action of DES in rice.

80-0776. Anasuya, R.; Gajalakshmi, V.; Rajendra, W.; Indira, K.; Swami, K. S.* (Dep. Zool. Sci., Venkateswara Univ., Tirupati 517502, India) **Effect of DDT on succinate and glutamate dehydrogenase activities in selected tissues of frog (*Rana hexadactyla*).** *Curr. Sci.* 48(18): 835-838; 1979 (16 references).

Frogs of medium size were double pithed and the liver, kidney, brain and gastrocnemius muscle quickly excised. Homogenates were prepared and, after centrifugation, the supernatant fractions were used for assays of succinate and glutamate dehydrogenase (SDH and GDH) activities. Certain fractions were then exposed to DDT. The *in vitro* effect of DDT was tissue specific. The SDH and GDH activities continuously decreased with increases in DDT concentrations from 2 to 20 μmoles. The study suggests that the liver GDH is perhaps more resistant to DDT effects than the GDH of other tissues, due to the high detoxification potential operating in the liver.

80-0777. Raetz, K. H.; Mattheus, A.; Heise, H.; Muller, J.; Haberzettl, R. (Klin. & Ambulanz Hautkrankheiten, Bereich Med., Wilhelm Pieck Univ. Rostock, DDR-2700 Schwerin, DDR) **Ueber den Einfluss eines Dinitro--*o*-kresol haltigen Pflanzenschutzmittels (Hedolit) auf die menschliche Reproduktion. [The influence of a dinitrocresol (DNOC) containing herbicide on human reproductivity.]** *Dermatol. Monatsschr.* 165(9): 658-664; 1979 (24 references) (German).

The effect of the dinitrocresol (DNOC)-containing pesticide Hedolit on reproductive function was studied. Two single doses of 0.1 g were applied epicutaneously to the skin of the back of guinea pigs on 2 consecutive days. No DNOC was found in the liver and spleen on day 3, and the DNOC residue level in the testicular tissue and ejaculate dropped from slightly above 10 μg/ml on day 2 to zero on day 3, while the serum level declined only slowly; values around 5 μg/ml were found even on days 10 and 11 after the application. The effect of Hedolit on the motility of human spermatozoa was studied in the concentration range of 0.0005-12.5 g/l. The lowest concentration at which motility-inhibiting effect was observed was 0.005 g/100 ml. Mutagenicity was studied in *Drosophila melanogaster.* The lowest effective (mutagenic) concentration was 50 mg/l, at which a slight increase in the rate of spontaneous mutations was seen compared with the controls (0.38% vs. 0.06%).

80-0778. Harris, M. (Natl. Inst. Health, Natl. Diabetes Data Group, Bethesda, MD 20205) **Classification and diagnosis of diabetes mellitus and other categories of glucose intolerance.** *Diabetes* 28(12): 1039-1057; 1979 (67 references).

This review indicates that carbon disulfide and the rodenticide Vacor (pyriminil) can cause conditions and syndromes which are associated with diabetes mellitus and impaired glucose tolerance. The review itself is a classification of diabetes and other categories of glucose intolerance based on contemporary understanding of the syndrome. The classification is proposed for use as a uniform framework in which clinical and epidemiological research can be conducted so that the results gained from such research will be more meaningful due to their increased uniformity.

80-0779. Kapp, R. W., Jr. (George Washington Univ., Washington, DC) **Evaluation of the genetic toxicity of 1,2-dibromo- 3-chloropropane in humans and rats.** *Diss. Abstr. Int. B* 40(4): 1516-1517; 1979.

The mutagenic potential of DBCP (dibromochloropropane), a soil fumigant, was investigated. Three groups of males rats were respectively administered DBCP at 0.73, 7.3, and 73 mg/kg of body wt. Each group contained 20 animals which wered dosed for five consecutive days. The high dose level was the highest non-toxic dose and the low dose approached the estimated human inhalation exposure based upon a level of 0.5 ppm. Colchicine was administered ip to all animals 24 hr after the last dose. The animals were sacrificed 2 hr after the colchicine injection and spermatogonial and bone marrow cells were extracted. Analyses indicate that there was a

statistically significant increase in the total number of aberrant cells observed in both bone marrow and spermatogonial tissues when compared to the controls. This increase is due primarily to the number of chromosome exchanges in both cell types. In addition, the increases were dose related with respect to the treatment administered. The correlation coefficient between the total number of abnormal bone marrow and spermatogonial cells was also found to be significant. An assay utilizing human sperm was performed quantitating Y chromosomal nondisjunction in 3 categories of human subjects: (1) non-exposed, (2) exposed to antineoplastic agents, and (3) DBCP-exposed. The data show that the incidence of YFF sperm increases after exposure to radiation and chemotherapeutic agents. The individuals exposed to DBCP exhibited an increased number of sperm containing two Y chromosomes when compared to non-exposed individuals. It is postulated that an agent which increases Y chromosomal nondisjunction (frequency of YFF sperm) will increase the probability of autosomal nondisjunction as well. In conclusion, DBCP has been shown to be a clastogenic agent in both the bone marrow and spermatogonial cells of male rats at dose levels as low as 0.73 mg/kg of body wt per day for 5 consecutive days. Further, DBCP, Adriamycin, and X-irradiation increase the incidence of YFF sperm. Sixteen of 18 DBCP-exposed workers fell outside the normal range while 43 of 45 of the non-exposed individuals fell inside the normal range. These differences between DBCP-exposed and non-exposed individuals were statistically significant (< 0.001) as determined by chi-square analysis with one degree of freedom. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7923410)

80-0780. Lusk, C. I. (Louisiana State Univ. & Agric. & Mech. Coll., Baton Rouge, LA) **Development of the cervical region of chicken embryos studied via the teratogenic effects of monocrotophos.** *Diss. Abstr. Int. B* 40(4): 1579; 1979.

The teratogenic effects of an organophosphate insecticide, monocrotophos, were studied during the embryonic development of the neural tube, notochord, myotome and vertebrae of the cervical region of White Leghorn chickens. Embryos 0 to 5 days old were treated once with 100 μg of monocrotophos and fixed at 6 days of incubation. The resulting cervical defects became increasingly severe with treatments at 0 to 2 days, were most severe when treated at 3 days of incubation, then decreased in severity when treated on the 4th or 5th day. The defects consisted of fused vertebral central and neural arches, a warped notochord, and poorly developed muscle. Light microscopic and electron microscopic studies were made of the development of the defects with treatment at 3 days of incubation (stage 20). The embryos were first observed at 3 hr after treatment at which time 39% of the embryos were abnormal (external observation). An histochemical stain for acetylcholinesterase (AChE) showed this enzyme to be present in the myotome and the neural tube, but not in the notochord of stage 20 embryos. Those compounds tested which inhibited AChE *in ovo* shortly after treatment at approximately stage 20 also caused the cervical defects when the embryos were observed at stage 29 (6 days of incubation). Counter treatment with pyridine-2-aldoxime methiodide (2-PAM), an AChE reactivator, corrected some but not all of the defects caused by monocrotophos. It was concluded that inhibition of AChE interfered with muscle development. This in some way caused a shortening or compression of the cervical region. With less than normal room to elongate, the notochord was forced into a curved shape. The vertebrae developed wedge-shaped to fit around these curves, and fused shortened vertebrae were the result. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7921971)

80-0781. Smith, T. D. (McGill Univ., Montreal, Canada) **The effects of six insecticides on non-target soil mesoarthropods from pasture on Ste. Rosalie clay loam, St. Clet, Quebec.** *Diss. Abstr. Int. B* 40(6): 2521; 1979.

This investigation involves the immediate and short-term effects of six insecticides: diazinon, fenitrothion, malathion, methoxychlor, Sevin (carbaryl) and Zectran (mexacarbate) on non-target soil mesoarthropods in a cattle pasture at St. Clet, Quebec. A faunal list of 144 species or groups of soil mesoarthropods is presented. Standing-crop values of species of Acari were determined from modified standing-crop equations. Both infinite and finite Constancy-domination Indices were used to construct a community model. The effects of insecticides on soil mesoarthropod population densities and possible standing-crop values were analysed using two-way analysis of variance and Duncan's Multiple Range test. All data were logarithmically transformed before analysis. Effects of duration of insecticides were noted. The greatest insecticide impact on soil mesoarthropod population density and standing-crop values occurred within the first week after application of insecticides. The effects of Sevin and Zectran lasted longer than those of the others. The seasonal distribution changes of soil mesoarthropods were greater than those caused by insecticides. Three species of Acari were selected as indicators of biocide impact. (Author abstract by permission. Copies of the thesis are available from University Microfilms)

80-0782. Kamenov, D. A.; Zolotarev, S. A. (A. N. Severtsov Inst. Evol. Morphol. & Anim. Ecol., Moscow, USSR) **Vliianie nekotorykh pestitsidov na ekologo-fiziologicheskie mekhanizmy model'nykh grupp dikikh domovykh myshei. [Effect of some pesticides on ecological-physiological mechanisms of a model group of wild house mice.]** *Dokl. Akad. Nauk SSSR* 249(3): 756-760; 1979 (9 references) (Russian).

In an attempt to evaluate the effect of pesticides on the autoregulatory processes in populations of mammals, concentrations of corticosteroid in the blood and the level of total metabolism were studied in wild house mice. Animals were kept separately and in groups (3 males and 3 females in each). Pesticides (simazine and heptachlor) were given in the food at doses used in agriculture. After a 2-day exposure animals were sacrificed, and the level of 11-oxyketosteroids was assessed fluorimetrically. Both heptachlor and simazine caused a marked increase in the level of protein-bound 11-OKS (41.2 μg% and 41.5 μg%, respectively, compared with 20.0 μg% in controls), free 11-OKS (27.9 and 20.2, respectively, compared with 7.3 μg% in controls), and the total concentration of 11-OKS (69.2 and 61.6 μg%, respectively, compared with 27.3 μg% in controls). Simazine significantly increased the level of metabolism measured by oxygen consumption (650.8 and 694.6 cm^3/100 g in mice kept alone and in groups, respectively, compared with 563.8 cm^3/100 g in control mice).

80-0783. Sokolov, V. E.; Kamenov, D. A. (A. N. Severtsov Inst. Evol. Morphol. & Ecol. Anim., Moscow, USSR) **O roli svoistv protsessov vozbuzhdeniia i tormozheniia nervnoi sistemy domovykh myshei (*Mus muscular* L.) v reguliatsii endokrinnogo otveta pri deistvii varfarina. [Role of characteristics processes of stimulation and inhibition of nervous system of (*Mus musculus* L. in regulation of endocrine response to warfarin.]** *Dokl. Akad. Nauk SSSR* 249(3): 764-768; 1979 (14 references) (Russian).

In an attempt to evaluate the mechanism of resistance of *Mus musculus* to warfarin, the level of 11-oxyketosteroids (11-OKS) was determined in the blood of mice with different types of nervous systems. Animals were sacrificed on day 7 of warfarin administration (70 and 260 mg/kg), and the level of 11-OKS was assessed fluorimetrically. It was found that the rate and the degree of warfarin inactivation depended upon the level and adequacy of endocrine response: the level of free 11-OKS showed a decrease in mice with strong types of CNS, compared to its increase in animals with intermediate and weak types of CNS.

80-0784. Mitchell, S. C.; Waring, R. H.* (Dep. Biochem., Univ. Birmingham, Birmingham B15 2TT, England) **Metabolism of phenothiazine in the guinea pig.** *Drug Metab. Dispos.* 7(6): 399-403; 1979 (61 references).

Adult guinea pigs were administered an aqueous suspension of 1% (w/v) phenothiazine by intubation, or the animals were injected over the left flank with phenothiazine or its sulfoxide at dose rates of 150 mg/kg body wt. Neonates only received phenothiazine injections at the same rate as adults. The animals were kept in metabolism cages; urine and feces were collected every 24 hr. During the first 24 hr period the adult phenothiazine-dosed animals excreted 7% of the fungicide and its conjugated metabolites. Neonates produced all these compounds, plus small amounts of leuco phenothiazone and thiazone as well. Phenothiazine- sulfoxide treated animals excreted traces of phenothiazine and phenothiazine. Both phenothiazine and its sulfoxide were retained in body tissues for considerable periods; 15% of the dose was still present after 7 days.

80-0785. Kalra, S. K.; Chahal, K. S. (Div. Plant Sci., Tuskegg Inst., AL 36088) **Degradation of diuron (3-(3,4-dichlorophenyl)- 1,1-dimethylurea) in cows.** *Ecotoxicol. Environ. Saf.* 3(4): 362-368; 1979 (10 references).

Diuron was fed to five dairy cows at 0-50 ppm concentration levels. About 50% of the diuron was detected in the urine, 10% in the feces and 5% in the blood. Milk samples did not contain diuron. A positive correlation was noted between the concentration of diuron products in urine and blood and a negative correlation between urine and feces. It is suggested that the remaining diuron absorbed in the body or degraded into undetectable metabolites.

80-0786. Bansal, S. K.; Verma, S. R.; Gupta, A. K.; Rani, S.; Dalela, R. C. (Pollut. Relevant Res. Lab., Postgrad. Dep. Zool., D.A.V. Coll., Muzaffarnagar 251001, India) **Pesticide-induced alterations in the oxygen uptake rate of a freshwater major carp *Labeo rohita.*** *Ecotoxicol. Environ. Saf.* 3(4): 374-382; 1979 (27 references).

Labeo rohita were exposed to chlordane 20 EC, Metasystox (methyl demeton) 25 EC, and Sevin (carbaryl) 50% WP. Three distinct phases were observed as these pesticides effected the oxygen uptake rate of the fish. First, a sensitization phase was noted in which fish became conscious to the given toxic concentration. Second, a responsive phase was noted in which the fish responded according to the intensity of the toxic environment. Third the normalization phase occurred in which the fish normalized or acclimatized to the environment. The length of each phase was apparently dependent in the different concentrations of pesticides used in the experiment. A critical threshold time was noted for the hyperactivity response which was 6-24 hr for chlordane, 0-6 hr for Metasystox, and 2-4 hr for Sevin. It is suggested that respiratory changes are good indicators of environmental stressors.

80-0787. Nehez, M.; Paldy, A.; Selypes, A.; Korosfalvi, M.; Lorinczi, I.; Berencsi, G. (Inst. Hyg. & Epidemiol., Univ. Med., Szeged, Hungary) **The mutagenic effect of trifluralin containing herbicide on mouse bone marrow *in vivo.*** *Ecotoxicol. Environ. Saf.* 3(4): 454-457; 1979 (14 references).

Trifluralin was administered ip to CFLP strain male mice. The mutagenic effect on chromosomes of bone

marrow was studied *in vivo*. A single dose of 0.20 g/kg was shown to be mutagenic (11.5% cells with aberrations). Two doses of 0.10 g/kg produced 9.5% cells with aberrations. Four 0.05 g/kg doses produced 8.0% cells with aberrations. Chromosome aberrations found included breaks, acentric fragments, and deletions. A single dose of 0.01 LD50 (0.006 g/kg) did not cause significant mutagenic changes.

80-0788. Nedkova-Bratanova, N.; Ivanov, E.; Savov, G.; Michailova, Z.; Krusteva, A.; Petrova, S. (Inst. Nutr., Med. Acad., Sofia, Bulgaria) **Effect of the pesticides phosalone and lindane on the activity of some dipeptidases and disaccharidases in rat intestinal mucosa.** *Enzyme* 24(5): 281-284; 1979 (6 references).

Male albino rats were given 21 μmol/kg phosalone, 14.8 μmol/kg lindane and 10.5 μmol/kg phosalone combined with 7.4 μmol/kg lindane. Slight to moderate changes were found in the dipeptidase activity after these doses have been given. A marked decrease was noted in intestinal disaccharidases after phosalone and lindane treatment had been continued for a 90 day period. This decrease was particularly noticeable in the case of sucrose. It is suggested that the mechanism of these changes may be direct injury to the enterocytes, affecting the disaccharidases of the brush border.

80-0789. Schimmel, S. C.; Patrick, J. M., Jr.; Faas, L. F.; Oglesby, J. L.; Wilson, A. J., Jr. (Environ. Res. Lab., US EPA, Gulf Breeze, FL 32561) **Kepone: toxicity and bioaccumulation in blue crabs.** *Estuaries* 2(1): 9-15; 1979 (11 references).

In the first part of a 2-fold experiment on the effects of Kepone (chlordecone) on blue crabs, 450 juvenile crabs were exposed to seawater containing 0.03 or 0.3 μg Kepone/l, or were fed oysters contaminated with 0.25 μg Kepone/g, for 56 days. Bioaccumulation of the pesticide by the crabs from the food-source alone was rapid and averaged approximately 0.1 μg/g in both muscles and in other tissues. Very little of the insecticide was taken up by the crabs directly from the water. Crabs fed Kepone-dosed oysters molted less frequently (n=48) than did control animals. The second part of the study involved feeding crabs with oysters from the James River, Virginia, containing 0.15 μg/g Kepone, or feeding laboratory Kepone-contaminated (0.15 or 1.9 μg/g) oysters for 90 days. Molting by all exposed crabs was significantly reduced (α = 0.05) and crab mortalities were significantly increased (α = 0.05).

80-0790. Ackermann, H.; Seidler, H. (Cent. Inst. Nutr., Acad. Sci. GRD, Potsdam-Rehbrucke, GDR) **Investigations on the fetal metabolism of phthalimide derivatives.** In: *Evaluation of Embryotoxicity, Mutagenicity and Carcinogenicity Risk in New Drugs.* Benesova, O., Rychtev, Z., and Jelinek, R., eds. (Univ. Karlova Press: Prague) pg 43-47; 1979 (5 references).

Fetal metabolism of, and excretion after intra-amnionic injection of the phthalimide derivatives Imidan (phosmet), chloromethyl phthalimide, oxymethyl phthalimide, and phthalimide have been studied. Labeled (^{32}P) Imidan was injected ip into exteriorized rat fetuses on the 19th or 20th day or gestation or into neonatal rats, and half lives of the pesticide were determined enzymatically and radiochemically. The half-lives were found to be 73 min in fetuses and 51 min in newborn animals. The maximum value of ^{32}P radioactivity was detectable 60 min after injection; at 2 hr the labeled compound had almost totally disappeared from the fetuses. No evidence could be obtained about the fate of the primary metabolites, chloromethyl phthalimide or oxymethyl phthalimide. Phthalimide has been found in fetuses after oral ingestion of the compound by pregnant rats. [Presented at the 3rd Symposium on Toxicological Testing for Safety of New Drugs]

80-0791. Berezovskaya, I. V.; Torchinsky, A. M. (Inst. Biol. Res. Chem., Kupavna, USSR) **Interrelationship of the teratogenic and embryotoxic effects under isolated and combined influence of chemicals.** In: *Evaluation of Embryotoxicity, Mutagenicity, and Carcinogenicity Ris in New Drugs.* Benesova, O., Rychter, Z., and Jelinek, R., eds. (Univ. Karlova Press: Prague) pg 127-130; 1979.

The teratogenic and embryotoxic effects of sodium salicylate, benlate (benomyl), and pyrimethamine, alone or in combination with DDT, to offspring of female Wistar rats injected at various times during pregnancy were investigated. Na salicylate at doses of 400, 600, or 800 mg/kg body weight injected on the 10th day of pregnancy resulted in 35.5, 82, and 100% postimplantation mortality of the fetuses, respectively, while the number of malformed fetuses was 39, 30, and 0%, respectively. Benlate at levels of 250 or 750 mg/kg injected on the 12th day of pregnancy resulted in 44 and 85% postimplantation mortalities, and 55 and 75% malformed fetuses, respectively. The injection of 20 mg DDT/kg weakened both the teratogenic and embryotoxic effects of Na salicylate, benlate, and pyrimethamine when these compounds were injected at doses of 400, 250, and 30 mg/kg, respectively. The teratogenic effects of higher doses of these drugs remained unsuppressed by DDT, indicating a dose-effect relationship between chemical toxicity, and the protective effects of DDT.

80-0792. Koundinya, P. R.; Ramamurthi, R. (Dep. Zool., Sri Venkateswara Univ. Coll., Tirupati, India) **Effect of organophosphate pesticide Sumithion (fenitrothion) on some aspects of carbohydrate metabolism in a freshwater fish, *Sarotherodon* (Tilapia) *mossambicus***

(Peters). *Experientia* 35(12): 1632-1633; 1979 (10 references).

A lethal (LC50/48 hr - 6 mg/l) concentration of the organophosphate (OP) pesticide Sumithion (fenitrothion) increased blood glucose levels and phosphorylase activity, but hepatic glycogen registered a fall, which indicated that the observed hyperglycemia was due to breakdown of hepatic glycogen.

80-0793. Wood, E.; Zerba, E.; de Villar, M.; de Licastro, S.; Melgar, F. (Lab. Entomotoxicol., CITEFA, Zufriategui & Varela, V. Martelli, Prov. Buenos Aires 1603, Argentina) **An insect acetylcholinesterase inhibitor from compound eyes of *Triatoma infestans* (Hemiptera).** *Experientia* 35(12): 1644-1645; 1979 (11 references).

The presence of an acetylcholinesterase inhibitor in the compound eyes of adult *Triatoma infestans* was demonstrated. The inhibitory activity was localized in the ocular pigments separated by disc gel electrophoresis. The inhibitor was selective against insect acetylcholinesterase, reversible, noncompetitive, and heat stable. (Author abstract by permission)

80-0794. Albrecht, R.; Dooh-Priso, E.; Faudemay, F.; Pelissier, M. A.; Carreau, J. P. (Lab. Biol., Conserv. Natl. Arts & Metiers, Groupe Rech. Physiophatol. Nutr., U 177, INSERM, F-75141 Paris Cedex 3, France) **Induction par le lindane des monoxygenases microsomales du foie chez le rat: effets d'un regime hyperlipidique. [Induction of liver microsomal monooxygenase by lindane in the rat: effects of a high fat diet.]** *Food Cosmet. Toxicol.* 17(5): 463-471; 1979 (35 references) (French).

Two groups of young male Wistar rats were fed either a normal or a high-fat (essentially lard) diet (3.5 and 39% w/w, respectively). After the first 2 wk, each group was subdivided equally into a control group and a group treated for the remaining 4 wk with lindane, 60 ppm (mg/kg diet) for the normal-fat group, and 93 ppm for the high-fat group, providing 18 μg lindane/Kcal in each case. The high-fat diet increased the potential activities of aniline hydroxylase and NADPH cytochrome *c* reductase and the cytochrome P450 concentration of the whole liver, and decreased the hexobarbital sleeping time. The fatty acid composition of microsomal phosphatidyl choline reflected a decrease in palmitic acid and an increase in stearic acid with the high fat diet. Lindane treatment accelerated aminopyrine- *N*-demethylation, measured *in vitro*, and increased the P450 content. The content of linoleic acid in microsomal phosphatidyl choline was increased by 32%, a finding already demonstrated by other authors using phenobarbital and ethanol as inducers. The increase in body weight and in adipose tissue due to the high fat diet was suppressed by lindane intake. An interaction of these two factors on adrenal catecholamine secretion could explain this antagonism. The hexobarbital sleeping time was lowered less by lindane in animals receiving the high fat diet, a finding in opposition to both lindane and diet effects upon the potential activities of microsomal monooxygenases. It seems possible that in the rat fed both lindane and a high fat diet, there may be a deficiency of NADPH for hepatic metabolism of hexobarbital. (Author abstract by permission)

80-0795. Kurisaki, E.; Sato, H. (Dep. Legal Med., Fukushima Med. Coll., Fukushima, Japan) **Tissue distribution of paraquat and diquat after oral administration in rats.** *Forensic Sci. Int.* 14(3): 165-170; 1979 (21 references).

Male Wistar rats were exposed to paraquat or diquat by oral administration of the LD50 or 0.5 LD50 of the chemicals. After 24 hours paraquat reached its highest levels in all organs studies with concentrations in the kidney and lung 2 to 3 times higher than at 2 hours after ingestion. Diquat concentrations were highest at 2 hours, with the exception of the kidney concentrations. Severe lung damage was noted at 24 hours after paraquat exposure. Diquat did not produce lung damage of a severe nature, but did cause intestinal distention and diarrhea. It is suggested that the difference in the toxicity of paraquat and diquat is related to their different tissue distribution and excretion.

80-0796. Nishizumi, M. (Dep. Public Health, Fac. Med., Kyushu Univ., Fukuoka 812, Japan) **Effect of phenobarbital, dichloro diphenyl trichloroethane, and polychlorinated biphenyls on diethyl nitrosamine induced hepato carcinogenesis.** *Gann* 70(6): 835-837; 1979 (13 references).

The tumor-enhancing effects of phenobarbital (Ph), DDT, and PCBs, singly and in combination after exposure of male Wistar rats to diethyl nitrosamine (DEN) were investigated. Greatest increases in liver wt relative to body wt were seen in groups of rats treated with DEN + PCB, DEN + Ph + PCB, and DEN + DDT + PCB (livers were 7.4, 8.2, and 9.2% of body wt, respectively, after 40 wk). Average numbers of liver tumors were significantly different from DEN-treated controls among the above-mentioned groups ($P < 0.01$, $P < 0.05$, and $P < 0.05$, respectively). The largest number of tumors was observed in the DEN + PCB treated group. PCBs were more responsible for hepatocellular carcinoma production than either Ph or DDT; the latter had the least significant tumor-enhancing effect.

80-0797. Nishimura, M.; Yamanaka, S. (Sch. Hyg., Tokyo Dent. Coll. Tokyo, Japan) **[Acute intoxication due to chemical substances and their treatments. Intoxication due to agricultural chemicals (pesticides), especially by organofluorines, arsenicals and nicotine.]** *Gekkan Yakuji*

(Pharmaceut. Mo.) 21(10): 2023-2028; 1979 (5 references) (Japanese).

The biochemistry and toxicological action of organofluorine, arsenical and nicotinic pesticides are reviewed. The mouse oral LD50 values of representative compounds from each group are given in tabular form. Organofluorines had LD50 values ranging from 1-7 (for sodium fluoroacetate) to 410 mg/kg (for *N*-(*p*-bromobenzyl) fluoroacetamide). Arsenical LD50's ranged from 50 (for calcium arsenate) to 2000-5000 mg/kg (for iron methane arsenate), and nicotinic LD50 values ranged from 24 (for nicotine) to 563 mg/kg (for anabasine). Acute toxicity symptoms of each type of pesticide are given and the actions of the pesticides on acetylcholine receptors and diagnosis and treatment of poisoning by these compounds are also discussed.

80-0798. Taylor, J. R.; Calabrese, V. P. (Dep. Neurol., Med. Coll. Virginia & Neurol. Serv., Veterans Adm. Hosp., Richmond, VA) **Organochlorine and other insecticides.** *Handb. Clin. Neurol.* 36: 391-455; 1979 (310 references).

The chemistry of the chlorinated hydrocarbon insecticides and other less used insecticides is reviewed. The laboratory evaluation of insecticide poisoning and clinical manifestations of acute intoxication of 37 insecticides are presented. The major manifestations of chlordane, dieldrin, aldrin, endrin, and DDT intoxication in humans are presented in tabular forms. In addition, clinical findings, pathology, treatment, and animal data are presented on heptachlor, endosulfan, mirex, toxaphene, Kepone (chlordecone), nicotine, fluorides, azobenzene, pyrethrins, dinitrophenols, organic thiocyanates, rotenone, and Ryania.

80-0799. Ordog, V. (Lab. Aquat. Biol., Plant Prot. & Agrochem. Res. Cent., Minist. Food & Agric., Szazhalombatta, Hungary) **Triazinszarmazek gyomirtoszerek hatasa az *Ankistrodesmus angustus* Bern. zoldalga szaporodasara. [Effect of triazine herbicides on the growth of the green alga *Ankistrodesmus angustus* Bern.]** *Hidrol. Kozl.* 59(7): 323-328; 1979 (30 references) (Hungarian).

The effects of atrazine (100% active ingredient), Hungazin PK (50% atrazine), Gesapax 50 (50% ametryne), Hungazin DT (50% simazine), and Gesagard (50% prometryne) on the growth of *Ankistrodesmus angustus* Bern. were studied. The EC50 values were found to be 300-380 μg/ml for atrazine, 300-345 μg/ml for Hungazin PK, 300-325 μg/ml for Hungazin DT, and < 150 μg/ml for Gesagard and Gesapax 50. The toxic concentration (La) was, however, 1-4 mg/l. The findings indicate that ametryne and prometryne are more toxic to the algae than atrazine and simazine.

80-0800. Mahmood, A.; Sanyal, S.; Agarwal, N.; Subrahmanyam, D. (Dep. Gastroenterol. & Biochem., Postgrad. Inst. Med. Educ. & Res., Chandigarh 160012, India) **Lipid composition of monkey intestinal brush border membrane: effect of DDT administration.** *Indian J. Biochem. Biophys.* 16(3): 175-177; 1979 (18 references).

A study was designed to determine the effects of DDT on the intestinal brush border membrane (BBM) of the rhesus monkey. Male rhesus monkeys were given an oral dose of 150 mg DDT/kg body weight in corn oil, with the control group receiving corn oil only. After 48 hr the animals were sacrificed, and the jejunal portion of the gut removed. The BBM was prepared, and the membrane lipids extracted and estimated. The membrane protein, total lipids, phospholipids and free cholesterol were higher in DDT-treated monkeys, but there was no effect of DDT on esterified cholesterol and triglyceride fractions of the membrane. In addition, sialic acid showed a marked decrease (1.32 μmol/100 mg dry wt BBM in controls and 1.13 μmol/100 mg in DDT-fed animals). The results are compared with the effect of DDT on the liver, and possible mechanisms for the effects are discussed.

80-0801. Mahajan, C. L.; Juneja, C. J. (Dep. Zool., Univ. Rajasthan, Jaipur 302004, India) **Effect of aldrin on peripheral blood of fish *Channa punctatus* (Bloch).** *Indian J. Environ. Health* 21(2): 162-172; 1979 (19 references).

Studies were carried out on the effects of various concentrations of aldrin on the peripheral blood of the air-breathing fish *Channa punctatus*. Female fish were exposed to aldrin in concentrations representing 10%, 20%, 30%, and 50% of the 48 hr LC50 (0.025, 0.050, 0.075, and 0.125 mg/l, respectively). Fish were sacrificed after 1, 2, 4, 7, 12 and 30 days, and various hematological parameters were determined. Aldrin caused a highly significant increase in RBC, hemoglobin and hematocrit values, with the increase greater and quicker with each higher sublethal dose. Mean corpuscular volume showed a highly significant increase, with mean corpuscular hemoglobin remaining static, and mean corpuscular hemoglobin concentration markedly decreasing. In addition, leukocytosis was observed in all fish exposed to aldrin. It is concluded that hematological parameters in fish can be convenient, sensitive indices of aquatic pollution, especially at sublethal levels.

80-0802. Agarwal, N.; Sanyal, S.; Khuller, G. K.; Chakravarti, R. N.; Subrahmanyam, D. (Dep. Biochem., Postgrad. Inst. Med. Educ. Res., Chandigarh, India) **Effect of acute administration of dichloro diphenyl trichloro ethane on certain enzymes of rhesus monkey.** *Indian J. Med. Res.* 68(6): 1001-1006; 1978 (21 references).

In order to assess the effects of dichloro diphenyl trichloro ethane (DDT) on enzymes, a group of 4 rhesus monkeys was given DDT in corn oil orally by stomach tube

at a dose of 150 mg/kg, with the control group receiving corn oil only. Forty-eight hr after treatment the animals were sacrificed, blood drawn intracardially and allowed to clot. Liver, brain, kidney, spleen and adrenals were removed. The tissues were homogenized, with supernatants being assayed for various enzymes. In the sera of DDT-fed animals there were marked increases in lactate dehydrogenase, transaminases, amylase and alkaline phosphatase, and no change in acid phosphatase. DDT caused increased levels of succinic dehydrogenase and transaminases in all tissues studied, and decreased alkaline phosphatase in all organs except the kidney. Lactate dehydrogenase, Mg^{2+}-ATPase, acid phosphatase and amylase increased in some of the tissues. It was suggested that these enzymatic effects indicate the occurrence of severe disturbances in intermediary metabolism in rhesus monkeys treated with DDT.

80-0803. Ivankovic, S.; Eisenbrand, G.; Preussmann, R. (German Cancer Res. Cent., Inst. Toxicol. & Chemother., D-6900 Heidelberg, BRD) **Lung carcinoma induction in BD rats after a single intratracheal instillation of an arsenic-containing pesticide mixture formerly used in vineyards.** *Int. J. Cancer* 24(6): 786-788; 1979 (13 references).

Male BD IX rats were given a single 0.1 ml intratracheal instillation of a calcium-arsenate containing vineyard pesticide. Of the 15 treated rats, 9 developed whitish-grey, hard, multicentric and infiltrating tumors in the lungs after an average induction time of 470 days. Most tumors were small and could only be detected by serial cuts. Other parts of the lungs were atelectatic and pneumonic. Seven of the 9 tumors were diagnosed as bronchogenic adenocarcinomas with pronounced stroma of connective tissue. Two tumors were bronchiolar/alveolar cell carcinomas. The pesticide mixture was concluded to be carcinogenic.

80-0804. Grisham, J. W. (Dep. Pathol., Sch. Med., Univ. North Carolina, Chapel Hill, NC) **Use of hepatic cell cultures to detect and evaluate the mechanisms of action of toxic chemicals.** *Int. Rev. Exp. Pathol.* 20: 123-210; 1979 (360 references).

An extensive review is presented on the use of cultured liver cells as components of *in vitro* systems in order to evaluate chemical toxicity. The cellular metabolism of chemicals and the major mechanisms by which activated metabolites are thought to produce cellular toxicity are reviewed. The general characteristics of short-term cultures of hepatocytes, co-cultures of hepatocytes and other cells, propagable hepatic epithelial cells, and organ and explant cultures of liver are described. The ability of the various cultures to metabolize chemicals, and the major toxic reactions are described. The toxic reactions attributed to metabolic products are listed for aflatoxins B_1, G_1, and B_2; N-2-acetylaminofluroene; benzo(*a*)pyrene; substituted biphenyls; bromobenzene; carbon tetrachloride, chlorpromazine; demethyl benzanthracene; dimethyl formamide; dimethyl nitrosamine; erythroymcin estolate, and 3-methyl-4- dimehylaminoazobenzene.

80-0805. Brooks, G. T.; Johnson, A. W. (Unit Invertebr. Chem. & Physiol., Agric. Res. Counc., Univ. Sussex, Brighton, England) **Chemicals and insects.** *Interdiscip. Sci. Rev.* 4(4): 279-289; 1979 (20 references).

A review of the integration of biology, biochemistry, and chemistry in developing environmentally safe, economically viable insect control methods is presented. Insect physiology research, historically leading to the development of chlorinated cyclodienes, pyrethroids, organophosphates, and currently insect hormones and pheromones, and the mode of action of these insecticides are discussed. The biochemistry of the development of resistance by certain target pests and the high toxicity to non-target organisms are illustrated for organophosphate and carbamate insecticides. The mechanism of biotransformation in insect and mammals to chlorinated insecticides and pyrethroid derivatives is evaluated. Also discussed are juvenile hormone analog preparations, the isolation of pheromones, and the potential success of using these compounds as insect control agents.

80-0806. White, E.; Scandella, D.; Katz, E. R. (Dep. Biol., State Univ. New York, Stony Brook, NY) **CIPC resistant mutants of *Dictyostelum discoideum.*** *J. Cell Biol.* 83(2-2): 341A; 1979.

CIPC [isopropyl-N (3-chlorophenyl) carbamate; chlorpropham] is a mitotic inhibitor disrupting microtubule organization in a number of plant systems. Low (2×10^{-5} *M*) concentrations of CIPC are able to inhibit mitosis, hence morphogenesis and multicellular development, in *Dyctostelum* algae. Recently a large set of mutants have been selected which are able to grow at increased concentrations of CIPC. Seven diverse mutant phenotypes have been characterized, including 2 temperature-sensitive classes, mutants requiring CIPC for growth, and mutants cross resistant to thiabendazole and/or nocodazole. [Presented at the 19th Annual Meeting of the American Society for Cell Biology]

80-0807. Cucchi, C.; Roth, J. S. (Biol. Sci. Group, Univ. Connecticut, Storrs, CT 06268) **Mechanism of induction of protein and RNA synthesis in *Tetrahymena* by cycloheximide.** *J. Cell Biol.* 83(2-2): 404A; 1979.

Results are reported on studies on the effects of cycloheximide (CHA) on the highly polyploid protozoan *Tetrahymena pyriformis.* The protozoan will grow in

relatively high concentrations of CHA after a long lag, with the extent of the delay dependent on CHA concentration. In cells grown in 4-12 μg CHA/ml, protein synthesis is significantly greater between 12 and 72 hr (before early log phase), while during the early log phase control and CHA treated cells synthesize DNA, RNA and protein at similar rates. An increase in mRNA synthesis occurs between 8 and 16 hr in CHA treated cells, and CHA treated cells show significantly higher amounts of RNA and protein than controls. It is suggested that the CHA effects are overcome by early activation of all or many of the redundant genes for the cell components necessary for protein synthesis. [Presented at the 19th Annual Meeting of the American Society for Cell Biology]

80-0808. Ivey, M. C. (Vet. Toxicol. & Entomol. Res. Lab., Agric. Res., SEA, USDA, College Station, TX 77840) **Chlorpyrifos and 3,5,6-trichloro- 2-pyridinol: residues in the body tissues of cattle wearing chlorpyrifos-impregnated plastic ear tags.** *J. Econ. Entomol.* 72(6): 909-911; 1979 (3 references).

Residues of the insecticide chlorpyrifos and its metabolite 3,5,6-trichloro- 2-pyridinol were determined in the body tissues of Hereford yearlings after they had a 10% chlorpyrifos impregnated plastic tag attached to each ear. Each tag contained ca. 1.2 g chlorpyrifos; therefore, each animals was initially exposed to ca. 2.4 g of chlorpyrifos. Residues of chlorpyrifos were found in fatty tissue only (maximum 0.030 ppm at 5 wk posttreatment slaughter). Residues of pyridinol were found only in fat, liver, and kidney tissues (maximum 0.032 ppm in kidney at 5 wk posttreatmet slaughter). No adverse effects resulted from attachment of the tags to the ears. (Author abstract by permission)

80-0809. Hirai, K. I. (Dep. Cytochem. Chest Dis. Res. Inst., Kyoto Univ., Sakyo-ku, Kyoto, Japan) **Mitochondria in alveolar epithelial cell lesion by bipyridilium herbicides in rat lung.** *J. Electron. Microsc.* 28(3): 209; 1979.

Paraquat and diquat (40 mg/kg) were administered to rats *via* iv injection. Within 6 hours of paraquat injection a swelling in the lung tissue and a loss of mitochondria matrix of type II cells was noted. Diquat injection was found to affect the mitochondria after a period of 24 hr. Some osmiophilic lamellar bodies became irregular in shape and were phagocytotized by the swollen mitochondria after these periods of time.

80-0810. Takada, K.; Levy, G. (Dep. Pharm., Sch. Pharm., State Univ. New York Buffalo, Amherst, NY 14260) **Comparative pharmacokinetics of coumarin anticoagulants XLIV: dose-dependent pharmacokinetics of warfarin in rats.** *J. Pharm. Sci.* 69(1): 9-14; 1980 (18 references).

Rats were given ^{14}C labeled warfarin iv at doses of 0.2 mg/kg, 12 hours after an injection of nonradioactive warfarin at 0.5 mg/kg or saline solution. A triexponential decrease in warfarin concentrations as a function of time was observed. Pretreatment with warfarin decreased the apparent volume of distribution, total plasma clearance, and intrinsic plasma clearance of the drug. In a second experiment rats were given warfarin iv in the order of 0.1-1.0-0.1 or 1.0-0.1-1.0 mg/kg at 2 wk intervals. At the 1.0 mg/g dose level the apparent volume of distribution, total plasma clearance, and intrinsic plasma clearance of the 1.0 mg/kg warfarin dose were found to be lower than those of the 0.1 mg/kg dose. The decrease in apparent volume of distribution was suggested to be due to decreased hepatic uptake.

80-0811. Yacobi, A.; Lai, C. M.; Levy, G. (Dep. Pharm., Sch. Pharm., State Univ. New York Buffalo, Amherst, NY 14260) **Comparative pharmacokinetics of coumarin anticoagulants XLV: pharmacokinetic and pharmacodynamic studies of acute interaction between warfarin and phenylbutazone in rats.** *J. Pharm. Sci.* 69(1): 14-20; 1980 (22 references).

Adult male rats were given iv racemic warfarin alone or in combination with phenylbutazone in a crossover experiment. A significant increase was noted in total plasma clearance, apparent volume of distribution and the disposition rate constant of warfarin during phenylbutazone administration. A significant decrease in the intrinsic plasma warfarin clearance was also noted. Serum protein binding of warfarin was decreased by phenylbutazone both *in vitro* and *in vivo*; the *in vivo* effect was more pronounced. No apparent effect was noted of phenylbutazone on prothrombin complex activity *in vitro*, but a modest anticoagulant effect was noted *in vivo*.

80-0812. Woodward, D. F. (US Fish & Wildl. Serv., Field Res. Lab., Jackson, WY 83001) **Assessing the hazard of picloram to cutthroat trout.** *J. Range Manage.* 32(3): 230-232; 1979 (11 references).

Specimens of cutthroat trout (*Salmo clarki*) were exposed to simulated normal field strength concentrations of picloram. Fry mortality was found to be increased when concentrations of picloram exceeded 1,300 μg/l. Fry growth was inhibited when concentrations were above 610 μg/l. No adverse effect on fry was observed at concentrations below 290 μg/l.

80-0813. Crouch, E.; Wilson, R. (Energy & Environ. Policy Cent., Jefferson Phys. Lab., Harvard Univ., Cambridge, MA) **Interspecies comparison of carcinogenic**

potency. *J. Toxicol. Environ. Health* 5(6): 1095-1118; 1979 (56 references).

A discussion is presented of the use of carcinogenesis data in animals as a predictor of human risk. Basic definitions and assumptions concerning the relationship between cancer incidence and dose of carcinogen (a linear, no-threshold theory) are described. Computing the potencies of various chemicals for various species is discussed. The potencies for 66 chemicals (including various fungicides, herbicides, organophosphates, and organochlorines) are evaluated in the mouse and rat. Results indicate that there are good interspecies correlations between the potenties, allowing interspecies extrapolation within an order of magnitude. A table comparing the potencies of 15 chemicals in the mouse, rat, dog, and human is given, and indicates the possibility of extrapolating between animals and humans within a factor of 10. A scheme for quantitatively estimating carcinogenic risk to humans is presented, and possible confusing effects (metabolism and synergisms) as well as possible exceptions are discussed. In the appendix, data used for computing the potency of some substances, such as acrylonitrile, chloroform and ethylene dibromide, are described in detail.

80-0814. Abou-Donia, M. B.; Graham, D. G. (Dep. Pharmacol. & Pathol., Duke Univ. Med. Cent., Durham, NC) **Delayed neurotoxicity of subchronic oral administration of leptophos to hens: recovery during four months after exposure.** *J. Toxicol. Environ. Health* 5(6): 1133-1147; 1979 (21 references).

Mixed breed laying hens (*Gallus gallus domesticus*) were used to demonstrate the delayed neurotoxicity due to subchronic treatment with leptophos. Hens were given a daily oral dose of 0.5-20.0 mg/kg technical leptophos in a gelatin capsule for 4 mo. The birds surviving at the end of the treatment period were kept under observation for an additional 4 mo, at which time they were sacrificed. Nervous system tissues and livers were removed from birds that were sacrificed and from those that died during the course of the experiment, and histopathological examinations were made. Clinical condition and neurotoxicity were dependent on dosage. Hens given 20.0 mg leptophos/kg suffered ataxia, paralysis, and death. Those treated with 5 and 10 mg/kg showed ataxia and no change in clinical condition during the 4 mo observation period. Hens treated with 2.5 and 1.0 mg/kg showed regression of neurological deficits after treatment stopped. Birds treated with 0.5 mg/kg developed mild ataxia and showed total recovery during the observation period. No lesions were observed in the livers or brain tissues examined. The most consistent histopathological change was the degeneration of axons and myelin in the spinal cord. A control group treated with tri-o-cresyl phosphate (TOCP) showed identical changes. A second control group receiving parathion showed initial leg weakness, but subsequently recovered without developing delayed neurotoxicity.

80-0815. Stolzenberg, S. J.; Hine, C. H. (Dep. Pharmacol., Univ. California Sch. Med., San Francisco, CA) **Mutagenicity of halogenated and oxygenated three-carbon compounds.** *J. Toxicol. Environ. Health* 5(6): 1149-1158; 1979 (27 references).

The Ames *Salmonella typhimurium* test was used to assess the mutagenicity of 4 structurally related 3-carbon compounds [1,2-dibromo-3- chloropropane (DBCP), α-chlorohydrin, epichlorohydrin, and glycidol], along with α-bromohydrin and epibromohydrin. The 4 compounds are known for their antifertility effects in males. *Salmonella* strains TA-1535 and TA-100 were used to detect base-pair substitutions, and strains TA-98 and TA-100 were used to test for frameshift mutations. All compounds were tested with and without S9 microsomal mix. With strain TA-100, DBCP was the most active compound, but required S9 activation. Epichlorohydrin, epibromohydrin, and glycidol (all containing an epoxide group) were highly active direct mutagens (not requiring S9). α-Chlorohydrin was the least active compound tested, being 40 times less active than α-bromohydrin. While all 6 compounds showed dose-related responsiveness for the base-pair substitution strains, they were all relatively inactive against the frameshift detections trains. Mutagenicity testing of these compounds in other systems is discussed.

80-0816. McCorkle, F. M.; Chambers, J. E.; Yarbrough, J. D. (Dep. Microbiol. & Immunol., Univ. Oregon Health Sci. Cent., Portland, OR) **Tolerance of low oxygen stress in insecticide-resistant and susceptible populations of mosquito fish (*Gambusia affinis*).** *Life Sci.* 25(17): 1513-1518; 1979 (10 references).

Insecticide resistant and susceptible populations of mosquito fish (*Gambusia affinis*) were compared for their tolerance to low oxygen tension. Formaldehyde or sodium sulfite were added to the aquaria to reduce dissolved oxygen. In another test, mineral oil was poured on the water to prevent oxygen exchange at the air-water surface, and in other aquaria a wire screen prevented fish from moving closer than 2 cm to the surface. In the mineral oil and wire screen experiments, the 24-hr mortality was twice as great in the resistant population. In the formaldehyde studies, the LC50 values were 2.3-fold higher for susceptible fish; when the oxygen concentration was reduced to 0.5 ppm with sodium sulfite, the 24-hr mortality was 3 times greater in the resistant population. It is pointed out that the resistant population has a lower basal oxygen consumption, which makes it less able to maintain oxygen levels in the blood in a low oxygen stress situation.

80-0817. Petersen, G. (Rigshosp. Apotek, DK-2100 Copenhagen, Denmark) **Laegemidler og graviditet. [Drugs and pregnancy.]** *Manedsskr. Prakt. Laegeg.* 57(3): 125-146; 1979 (Danish).

The possible embryotoxic and teratogenic effects

of drugs taken during pregnancy are reviewed. An epidemic of cerebral palsy with microcephaly was reported from Japan due to the consumption of methylmercury contaminated fish by pregnant women. DDT and DDE were demonstrated in the blood and tissues of newborn babies in America. It is suggested that while the presence of DDT is indicative of recent exposure, DDE indicates a more long-term exposure.

80-0818. Calabrese, E. J. (Div. Public Health, Univ. Massachusetts, Amherst, MA 01003) **Should the concept of the recommended dietary allowance be altered to incorporate interactive effects of ubiquitous pollutants.** *Med. Hypotheses* 5(12): 1273-1285; 1979 (29 references).

Studies which demonstrate the possible effects of ascorbic acid against environmental pollutants are reviewed. Topics discussed include the interaction of ascorbic acid and toxic substances, smoking and ascorbic acid, nitrosamine formation, the rationale for the ascorbic acid Recommended Dietary Allowance (RDA), the possibility of altering the RDA to provide protection against environmental toxicants, and a case for supplementation with ascorbic acid. The environmental pollutants considered include industrial hydrocarbons (such as PCB and chloroform), heavy metals, chlorinated hydrocarbon insecticides (DDT, dieldrin), and organophosphate insecticides. It is concluded that at the present time the data do not warrant changing the RDA for ascorbic acid, and that continued research on nutrient-pollutant interactions is necessary.

80-0819. Tanooka, H. (Radiobiol. Div., Natl. Cancer Cent. Res. Inst., Tsukiji, Chuo-ku, Tokyo 104, Japan) **Application of *Bacillus subtilis* spores in the detection of gas mutagens: a case of ethylene oxide.** *Mutat. Res.* 64(6): 433-435; 1979 (7 references).

Experiments are described in which repair-deficient, excision- repair-deficient and polymerase-I- deficient *Bacillus subtilis* spores were used to determine the mutagenicity of gaseous ethylene oxide (EO). *B. subtilis* strains used were: HA101, TKJ5211, and TKJ8201. Spores of each strain were layered on a membrane filter then sealed in polyethylene bags with EO gas (27.3% EO and 72.7% freon gas) for up to 100 min. Spores were then plated on the selective medium for determination of surviving spores and His+ revertant colonies. Survival curve results showed an exponential decrease of survival with increasing exposure time. EO was found to be a direct mutagen, with mutation frequency increasing by a power of 2 of the exposure time.

80-0820. LeWitt, P. A. (Dep. Neurol., Stanford Univ. Sch. Med., Stanford, CA) **The neurotoxicity of the rat poison Vacor. A clinical study of 12 cases.** *N. Engl. J. Med.* 302(2): 73-77; 1980 (18 references).

Twelve cases involving the ingestion of Vacor (pyriminil) are described. Clinical presentations were variable, but hyperglycemic ketoacidosis, orthostatic hypotension, gastrointestinal hypomotility, peripheral neuropathy, and encephalopathy were typical. Nervous dysfunction developed immediately in some cases and over a period of several days in others. Nicotinamide given parenterally within minutes of the ingestion, is suggested as a possible means of prevention of Vacor toxicity. Nicotinamide administration after the first minutes was found to be of little help in these cases. In patients who survived, neurologic improvement took many months and full recovery was uncommon.

80-0821. Goralski, H.; Frol, H. (Neurolog. Branch, Joint Prov. Hosp., PL-10561 Olsztyn, Poland) **Encefalopatia po zatruciu zwiazkami organicznymi rteci. [Encephalopathy following poisoning with organic mercury compounds.]** *Neurol. Neurochir. Pol.* 13(4): 371-376; 1979 (17 references) (Polish).

The clinical course of a family of 3 was followed for 2 yr after accidental acute mercury poisoning. Poisoning was due to the ingestion of the meat of pigs and chickens fed wheat treated with a methylmercury fungicide. After 4 mo the blood mercury levels were determined to be 650, 500, and 175 ng/ml, respectively, versus a normal range of 1.56-18.72 ng/ml. The severity and course of the poisoning were correlated with the mercury levels in the blood. The patients with the highest mercury levels (650 and 500 ng/ml) were completely disabled 2 yr after the poisoning due to high-grade ataxia, dysarthria, and concentric narrowing of the field of vision, despite treatment with Cuprenil, Thioctacid, vitamin B complex, and rehabilitation. In the least severe poisoning case (blood mercury level 175 ng/ml), the pathological symptoms disappeared completely after a short treatment.

80-0822. Norris, D. M. (Russel Lab., Univ. Wisconsin, Madison, WI 53706) **Chemoreceptor proteins.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed., (NY: Plenum Press) 59-77; 1979 (35 references).

Studies performed on the sugar receptor of the blowfly (*Phormia regina*) and the naphthoquinone receptors of *Scolytus multistriatus* and *Periplaneta americana* are reviewed to determine physico-chemical mechanisms of receptor- messenger interactions. Ligand effects on insect behavior, ultrastructures of the chemisensilla, the electrophysiology of chemoreceptors, ligand binding by receptor lipoproteins, and the electrochemistry of energy transduction by the receptors are correlated through multidisciplinary investigations. The role of sulfur, as sulfhydryl and disulfides, in insect receptor processes are defined.

80-0823. Miller, T. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Mode of action of insecticides: insights gained from neurophysiological preparations of intact or dissected insects.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed., (NY: Plenum Press) 79-96; 1979 (35 references).

Information was gathered on the neural coordination in the thoracic ganglion of the house fly by recording potentials from the dorso longitudinal flight muscles. Various compounds were applied directly to the thoracic ganglion. Quantitative responses were measured as the time from treatment until a disruption appeared in neural coordination. The mechanism of resistance to insecticides was obtained for house fly strains resistant to organophosphates or pyrethroids. Intrinsic activity measurements were obtained for carbamates, organophosphates, pyrethroids and other insecticidal chemicals.

80-0824. Gammon, D. W. (Univ. Cambridge, Dep. Zool., Cambridge CB2 3EJ, England) **An analysis of the temperature-dependence of the toxicity of allethrin to the cockroach.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed., (NY: Plenum Press) 97-117; 1979 (28 references).

The neurophysiology of allethrin toxicity in the cockroach is reviewed. The temperature dependent physiology of peripheral and central axons was utilized. Studies of the hyperexcitation of peripheral and central neurones of the cockroach showed that at 32°C both effects were primary in the toxicity allethrin to the insect. However, when tests were conducted at 15°C hyperexcitation of the peripheral nervous system by allethrin was the direct effect, with abnormalities in the central nervous system being a secondary one. Nerve blockage at both temperatures was seen as a secondary consequence of the insecticide. Tedrodotoxin protected the cockroach by reversibly blocking the peripheral nerves which would normally have been hyperexcited by allethrin.

80-0825. Lund, A. E.; Hollingworth, R. M.; Yim, K. W. (Dep. Entomol., Purdue Univ., West Lafayette, IN 47906) **The comparative neurotoxicity of formamidine pesticides.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed., (NY: Plenum Press) 119-137; 1979 (50 references)

The mode of action of chlordimeform (CDM) was studied on larvae of the tobacco hornworm. Two different effects were noted. Depressant actions were noted which were suggested to be the result of a rather non-specific membrane stabilizing effect of CDM. This effect was noted primarily with exposure to high dose levels. The lower dose levels caused excitatory actions to take place. This neural excitation drives the behavioral aberration and is caused by some synaptic action other than at cholinergic synapses. It is suggested that the mechanism by which CDM achieves protection for plants or animals from arthropods is different from the mechanism which produces CDM cardiovascular toxicity in mammals.

80-0826. Shankland, D. L. (Dep. Entomol., Mississippi State Univ., Mississippi State, MS 39762) **Action of dieldrin and related compounds on synaptic transmission.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed., (NY: Plenum Press) 139-153; 1979 (30 references).

A review of dieldrin action on cholinergic synapses is presented. A summarization of experiments involving isolated nerve cords treated with dieldrin indicates dieldrin action enhances transmitter release and is calcium dependent. Other tests involving dieldrin and isomeric aldrin diols are also reviewed. It is concluded that the diols are less toxic to both intact insects and isolated nerved cords than unmetabolized dieldrin. Also discussed is a correlation between the toxicity symptoms produced by dieldrin and its lethality.

80-0827. Woolley, D. E.; Chernobieff, J. R.; Reiter, L. W. (Dep. Anim. Physiol., Univ. California, Davis, CA 95616) **Effects of parathion on the mammalian nervous system.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed., (NY: Plenum Press) 155-181; 1979 (46 references).

Symptoms of parathion poisoning in different animal species is discussed. The difference depends on the relative stimulation of muscarinic versus nicotinic and central versus peripheral AChE receptors. Studies are reviewed which trace the time course of AChE inhibition and recovery, and describe the inhibition of AChE by paraoxon. Behavioral and other neurological effects of parathion administration on the rat are also reviewed. Effects observed on the visual evoked potentials may result from activation of cholinergic synapses at the level of the pupil or retina, or at central visual stations in the lateral geniculate, tectum, cortex or other brain areas. Similar studies on the monkey are described. The relation between the brain AChE inhibition and neurological effects is considered.

80-0828. Van den Bercken, J.; Kroese, A. B. A.; Akkermans, L. M. A. (Inst. Vet. Pharmacol. & Toxicol., Univ. Utrecht, Utrecht, The Netherlands) **Effects of insecticides on sensory nervous system.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed., (NY: Plenum Press) 183-210; 1979 (83 references).

Experiments are reported which demonstrate a similarity between the action of DDT and allethrin in the peripheral nervous system of the frog, in spite of the marked difference in their molecular structure. The sensory ner-

vous system is strongly affected, producing pronounced repetitive activity in sense organs and in sensory nerve fibers. Both compounds caused marked repetitive firing of the presynaptic motor nerve terminals in the frog motor end-plate, but without inducing repetitive activity in the more proximal part of the motor fibers. In high concentrations allethrin caused a moderate blocking action which was not noted with DDT.

80-0829. Narahashi, T. (Dep. Pharmacol., Northwestern Univ. Med. Sch., Chicago, IL 60611) **Nerve membrane ionic channels as the target site of insecticides.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed. (NY: Plenum Press) 211-243; 1979 (80 references).

The effects of DDT on the nervous system are discussed. DDT and its oxetane analog EDO facilitate synaptic and neuromuscular transmissions by inducing repetitive firing in the presynaptic nerve terminal. The postsynaptic membrane is not appreciably affected. Further analysis of DDT effects on nerve membranes in an attempt to determine the specific target site of DDT is considered. The increase in negative after-potential which serves as a sustained stimulation was concluded to form the basis for repetitive response by DDT and EDO. The slowing of the falling phase of the sodium current is the primary cause of the increase in negative after-potential. This increase is also due in part to the decrease in the steady-state potassium current. It is suggested from the results of voltage clamp analyses of the sodium channel kinetics, that EDO interacts with the open sodium channel in 2 steps, forming the non-inactivating, EDO-bound, conducting sodium channel. Sodium ions are caused to flow which allows the creation of a prolonged sodium current which in turn increases the negative after-potential. The time constant of the sodium inactivation is prolonged only by 50% after application of EDO.

80-0830. Matsumura, F.; Ghiasuddin, S. M. (Pestic. Res. Cent., Michigan State Univ., East Lansing, MI 48824) **Characteristics of DDT-sensitive Ca-ATPase in the axonic membrane.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed. (NY: Plenum Press) 245-257; 1979 (23 references).

Lobster nerves are shown to possess a highly DDT-sensitive Ca-ATPase which is cation dependent and is totally inhibited by DDT. It is suggested that this inhibition is related to the process of DDT poisoning. *In situ* studies with lobster nerves showed that the prolonged falling phase or increased negative after potential is markedly enhanced at low calcium ion concentration, and returned to normal at high external calcium ion concentrations in the bathing medium. The phenomenon of Ca-ATPase inhibition is concluded to fit well into the overall idea of DDT induced nerve excitation processes.

80-0831. Jones, S. W.; Sudershan, P.; O'Brien, R. D. (Sect. Neurobiol. & Behav., Cornell Univ. Ithaca, NY 14853) **Interaction of insecticides with acetylcholine.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed. (NY: Plenum Press) 259-275; 1979 (61 references).

Acetylcholine receptors as targets for insecticide action are discussed. The action of insecticides on acetylcholinesterase activity can be fatal to insects due to interference with cholinergic synaptic transmission. Some insecticides apparently act by blocking the acetylcholine receptor itself. The properties of acetylcholine receptors from different vertebrate tissues are discussed. Some are affected by nicotine and related drugs, and others by muscarine and related chemicals. Studies are reviewed which use α-bungarotoxin and quinuclidinyl benzilate to investigate acetylcholine receptors in insects, especially in *Drosophila.* The presence of a third receptor in insects is discussed.

80-0832. Fukuto, T. R. (Univ. California, Riverside, CA 92521) **Effect of structure on the interaction of organophosphorus and carbamate esters with acetylcholinesterase.** In: *Neurotoxicology of Insecticides and Pheromones.* Narahashi, T., ed. (NY: Plenum Press) 277-295; 1979 (40 references).

The toxicity of organophosphorus and carbamate esters to insects and other living creatures due to the ability to inactivate acetylcholinesterase is discussed. The mechanism of inhibition, a chemical reaction between the enzyme and the inhibitor, is explained. The overall reaction leads to the phosphorylation of the serine hydroxyl group. The phosphorylated enzyme is highly stable and in some cases is irreversibly phosphorylated. The activity of the anticholinesterase depends largely on the reactivity of the ester. Steric effects are often found to strongly influence inhibitory activity as well. Chirality at the phosphorus center often has a profound effect on the anticholinesterase activity of the organophosphorus ester, which is suggested to be due to stereospecific accommodation by the esteratic site of the different groups attached to the phosphorus atom. In contrast to the phosphorylated AChE, the carbamaylated enzyme is said to be less stable and undergoes spontaneous regeneration to the free enzyme with a half-life velocity of 30-60 min. Substituent effects are also considered.

80-0833. Kawai, S.; Fukushima, M.; Oda, K.; Uno, G. (Osaka Munic. Inst. Environ. Sci., Osaka, Japan) **[Pesticide residues and fishes. I. Uptake of diazinon by rainbow trout.]** *Osaka Shiritsu Kankyo Kagaku Kenkyusho Hokoku (Rep. Osaka Munic. Inst. Environ. Sci.)* 1979: 205-206; 1979 (Japanese).

Uptake of diazinon from water was investigated on 10 yearling rainbow trout in 70 *l* vessels. The fish were kept in about 0.5 ppm diazinon for 7 days and determinations of

diazinon in the water and in fish tissue were performed everyday. Diazinon in the fish tissue was determined by dry column-FPD column gas chromatography. Concentrations of diazinon in fish tissues were maximum on day 1, about 600 ppm. Reduction of residues occurred from day 2 onward and were about 400 ppm on day 7. The water concentrations decreased in the first 24 hr from 0.5 to 0.2 ppm. On day 7 water diazinon concentrations were 0.125 ppm. In a second experiment, diazinon was added to the water at an initial concentration of 0.07 ppm. Diazinon levels in fish tissue reached 10-15 ppm after 1 hr. After 24 hr the fish were placed in pure water and clearance was measured; > 50% of the diazinon absorbed was excreted or metabolized in 3 hr, > 75% in 24 hr, and > 99% after 4 days.

80-0834. Arena, J. M. (Duke Univ., Durham, NC) **Drug and chemical effects on mother and child.** *Pediatr. Ann.* 8(12): 10, 15-18, 21, 25, 27; 1979 (4 references).

Exposure of the human fetus to drugs and chemicals present in the mother's body is discussed. Heavy metals are considered to be the most serious environmental pollutants affecting the fetus. Accumulation of heavy metals in the human body due to inborn metabolic errors, impaired excretion due to concomitant disease or developmental immaturity, and the ingestion or absorption of large amounts of contaminated food or water are discussed. The use of fungicides in the pulp and paper industry and in seed treatments is mentioned as a source of mercury contamination in the environment. The use of methyl mercury and its presence as a significant contaminant of the environment, reaching humans by ingestion of contaminanted fish, is also discussed. Possible nerve damage and toxic effects on developing tissue due to the long retention time of mercury in the human body are considered to be of particular concern with respect to the fetus. The ability of mercury to pass through mothers' milk to the infant is also mentioned. Other environmental contaminants considered include lead; cadmium; the herbicide 2,4,5-T; and PCBs.

80-0835. Quistad, G. B.; Staiger, L. E.; Schooley, D. A.; Sparks, T. C.; Hammock, B. D. (Biochem. Dep., Zoecon Corp., Palo Atlo, CA 94304) **The possible role of carnitine in the selective toxicity of the miticide cycloprate.** *Pestic. Biochem. Physiol.* 11(1-3): 159-165; 1979 (20 references).

Experiments were performed to determine the role of the cofactor carnitine in the toxicity of the miticide cycloprate. Titers of carnitine were assayed in tobacco hornworm, housefly, grasshopper, tobacco budworm, mealworms and selected stages of mite development. Insects contained more total carnitine than did mites. Mite eggs contained less than the other mite stages. Selective ovicidal toxicity appears to result from the production of cyclopropane carboxylic acid, and its conjunction with carnitine. Combinations of carnitine and various metabolic products occur in different stages of development because metabolism varies among stages. The authors conclude that the selective ovicidal activity of cycloprate in mites is a function of the sequestration of carnitine as a metabolite leading to an inability to transport long-chain fatty acids into mitochondria. Therefore, lipid utilization is disrupted, causing death.

80-0836. Uppal, R. P.; Ahmad, A. (Dep. Physiol. & Pharmacol., Haryana Agric. Univ., Hissar, India) **Relevance of hematochemical studies in organophosphate toxicity.** *Pesticides* 13(9): 45-47; 1979 (27 references).

A review is presented which attempts to highlight the relevance of various hematological parameters being used to confirm the diagnosis and the extent of organophosphate toxicity. Blood cholinesterase depression can be a sensitive indicator of organophosphate exposure, but the degree of depression does not necessarily correlate with the extent of symptoms. This parameter is more unreliable in cases of subacute toxicosis, as compared with acute toxicosis. Serum glutamic oxalacetic transaminase (SGOT) activity has been found to correlate well with the degree of exposure and the severity of symptoms, especially in subacute toxicosis. Changes in serum β-glucuronidase activity have been reported to be sensitive, but not specific, indicators of organophosphate poisoning. Other parameters which may aid in confirming diagnosis and intensity of toxicity are blood glucose, lactic acid levels, and hematocrit.

80-0837. Vessell, E. S. (Dep. Pharmacol., Pennsylvania State Univ. Coll. Med., Hershey, PA) **Intraspecies differences in frequency of genes directly affecting drug disposition: the individual factor in drug response.** *Pharmacol. Rev.* 30(4): 555-563; 1979 (26 references).

Genetic and environmental factors causing large interindividual variations among human subjects in the disposition of and response to foreign chemicals are discussed in this review. It is noted that paraoxone (paraoxon) can elicit signs and symptoms of polymorphic serum aryl esterase activity. An example of an unusual form of toxicity is noted where spontaneous preadaptive mutations occur; these mutations are produced at sites that code for proteins serving as receptors. A pedigree is presented in which resistance to warfarin was transmitted as an autosomal codominant trait through three generations. It is also noted that various environmental chemicals such as DDT, PBCs, and polycyclic hydrocarbons can alter basal, genetically controlled hepatic drug-metabolizing enzyme activity.

80-0838. Doherty, J. D. (Toxicol. Branch, Hazard Eval. Div. TS-769, US EPA, Washington, DC 20460)

Insecticides affecting ion transport. *Pharmacol. Ther. Part A* 7(1): 123-151; 1979 (124 references).

The effects of insecticides on the action potential and associated ion transport, and synaptic and neuromuscular effects are reviewed. Organochlorine insecticides (DDT and its analogs), allethrin, pyrethroids, aldrin, and dieldrin have been demonstrated to alter the ability of excitable tissue in regard to selective permeability of Na^+ and K^+ associated with the action potential of an impulse. Transmitter release associated with ion transport is also affected by certain insecticides and other pesticides. Organophosphates and/or carbamates react to phosphorylate or carbamylate axonic membrane components to disrupt normal nerve function. Certain organophosphates [DFP, parathion, Bidrin (dicrotophos), paraoxon, and phosphoric acid 2,2-dichlorovinyl dimethyl ester (dichlorvos)] affect neuromuscular transmission, while organochlorines such as dieldrin, lindane, aldrin, and DDT alter synaptic transmission. Inhibition of ATPase associated with the sarcoplasmic reticulum and Ca^{++} binding are presented as possible modes of action of DDT in peripheral nerves.

80-0839. Snyder, R.; Remmer, H. (Thomas Jefferson Univ., Philadelphia, PA) **Classes of hepatic microsomal mixed function oxidase inducers.** *Pharmacol. Ther. Part A* 7(2): 203-244; 1979 (380 references).

The types of chemicals that can induce the mixed function oxidase (MFO) system in the liver are reviewed, with emphasis on the effects of barbiturates and polycyclic aromatic hydrocarbons. In addition, the general characteristics of the induction process are described. Data is presented which indicates that DDT induces MFO activity in the rat, sheep, horse, squirrel monkey, and Japanese quail. Aldrin, dieldrin, hexachlorobenzene, lindane, mirex, chlordane, and toxaphene have also been shown to induce MFO. Environmental contaminants which have been found to induce MFO include TCDD, PCBs and tetrachloro azoxybenzene. The effects of steroids and related compounds, and xanthines are also discussed. For each compound the studies relating to MFO induction are described in detail.

80-0840. Allen, J. R.; Hargraves, W. A.; Hsia, M. T. S.; Lin, F. S. D. (Dep. Pathol., Univ. Wisconsin Med. Sch., Madison, WI 53706) **Comparative toxicology of chlorinated compounds on mammalian species.** *Pharmacol. Ther. Part A* 7(3): 513-547; 1979 (325 references).

The lethality, effects exerted on general health, immunologic competence and mutagenic, carcinogenic and teratogenic potentials of various herbicides, insecticides, contaminants and additives are discussed. Particular emphasis is placed on the changes these chemicals bring about in the higher mammalian species. The chemicals considered include DDT, cyclodiene insecticides (chlordane, aldrin, dieldrin, heptachlor, and endrin), chlorobenzenes (hexachlorobenzene), hexachloro cyclohexanes (BHC isomers), chlorophenols, chlorophenoxy acetic acids (2,4-D and 2,4,5-T), polychlorinated biphenyls (PCBs) and tetrachlorodibenzo- *p*-dioxin (TCDD).

80-0841. Atanasova, I. (VPI, Shumen, Bulgaria) **Vliyanie na pestitsida kheptakhlor vurkhu populatsii ot gorska mishka. [Effect of the pesticide heptachlor on the wood mouse population.]** *Priroda (Sofia)* 27(4): 69-73; 1978 (Bulgarian).

The effect of heptachlor, distributed mixed with seeds at a rate of 2 kg/100 kg, on wood mouse populations in the Shumen region, Bulgaria, was studied under field conditions. The mouse population increased considerably during the April-September period both in the control fields sown with seeds without heptachlor and in the experimental fields, but it remained considerably lower in the treated fields during the last few months of the investigation period. Reduction of testicles and uterine horn length, and of testicle weight, were found in the captured animals. The percentage of pregnant females and the mean number of embryos per pregnant female were also lower in the treated fields. During the early phase of the experiment, the highest heptachlor concentration (1.6 mg/kg) was found in the liver of the animals. At the end of the observation period, the heptachlor epoxide level in the liver was 0.5 mg/kg.

80-0842. Hammond, B.; Katzenellenbogen, B. S.; Krauthammer, N.; McConnell, J. (Inst. Environ. Stud., Univ. Illinois, Urbana, IL 61801) **Estrogenic activity of the insecticide chlordecone (Kepone) and interaction with uterine estrogen receptors.** *Proc. Natl. Acad. Sci. USA* 76(12): 6641-6645; 1979 (26 references).

Rats were injected for 3 days with 50 mg/kg of *o,p'*-DDT, mirex or chlordecone, or 50 μg/kg estradiol to determine the uterotrophic activities of these substances. Uterine weights determined 24 hr after the last injection were: control 27.7 ± 1.8 mg, estradiol 85.7 ± 6.5 mg, *o,p'*-DDT 28.6 ± 0.9 mg, mirex 28.1 ± 2.8 mg, and chlordecone 106.1 ± 2.5 mg. Estradiol and chlordecone values were significantly different from the control. Chlordecone interacted with the estrogen receptor system in the uterus and, *in vivo*, behaved like a weak estrogen with prolonged activity. Chlordecone was found to compete with estradiol for binding to the cytoplasmic receptor, translocate receptor sites to the nucleus *in vitro* and *in vivo*, increase uterine weight and stimulate synthesis of the progesterone receptor. The considerable estrogenic activity of chlordecone was suggested to be derived from its long half-life and bioaccumulative character.

80-0843. Zherebchenko, P. G.; Terekhov, A. V.; Belavina, L. P.; Besedina, L. N.; Znamenskii, V. V.

(Author address not given) **Vliyanie dioksida tiomochevinyi na toksichnost' i protivoluchevuiu aktivnost' serosoderzhashchikh radioprotektorov. [Effect of thiourea dioxide on the toxicity and radioprotective efficiency of sulfur-containing radioprotectants.]** *Radiobiologiya* 19(3): 377-380; 1979 (9 references) (Russian).

It was demonstrated that thiourea dioxide (TUD) can modify the toxicity and activity of sulfur-containing radioprotectants. Random-bred mice were inoculated ip with cystaphos, AET, or cystamine alone, or in combination with TUD, and irradiated at the rate of 450 R/min. The survival of irradiated mice was monitored for 30 days. It was found that TUD reduced the toxicity of protectants (measured by the ratio of the LD50 of the combination to the LD50 of the protectants: 1.46, 1.17, and 1.15, respectively). Simultaneously, TUD decreased the radioprotective activity of sulfur-containing compounds.

80-0844. Serban, M.; Nita, S.; Olinescu, R. (Dep. Biochem., Fac. Vet. Med., Bucharest, Rumania) **Studies on the SH⇌SS equilibrium in biological media. XIII. The metabolism of some organophosphorous compounds chronically administered to rats.** *Rev. Roum. Biochim.* 16(2): 147-152; 1979 (20 references).

Wistar rats were given organophosphorus compounds ip. Compounds administered included (Selephos (parathion), Mintacol (paraoxon), Carbetox (malathion), and Dipterex (Danex; trichlorfon). These compounds caused a significant increase in NADH and NADPH-dependent cytochrome *c* reductases and aniline hydroxylase activities. Associated with these increases were increases of hepatic GSH transferase and serum LDH and GPT activities. A decrease was noted in serum cholinesterase. The survival of the test animals was increased by administration of cystamine with parathion in sublethal doses. This treatment also decreased the fatty infiltration in the liver.

80-0845. Moldoveanu, E.; Mandache, E.; Serban, M.; Filipescu, G. (Dep. Chem., Med. Vet. Sch., R-35 Bucharest, Rumania.) **Hepatic ultrastructural lesions induced by parathion in rats.** *Rev. Roum. Biochim.* 16(3): 217-219; 1979 (6 references).

A group of male Wistar rats was administered an acute lethal dose of parathion (5-6 mg/animal). A second group was given chronic doses (5 daily doses of 0.8 mg parathion/animal). Liver samples from the acutely intoxicated group showed minor lesions, while rats which underwent chronic parathion intoxication showed advanced dystrophic hepatocytic lesions. It is suggested that the minor liver damage in the former group indicates that the main toxic action of parathion occurs at sites other than in the liver, namely at the nervous vegetative system. It is concluded that hepatocytic injuries should be regarded as secondary in cases of parathion intoxication.

80-0846. Yatomi, T.; Ueda, K.; Kawai, M. (Sch. Hyg., Fac. Dent., Showa Univ., Tokyo, Japan) **[Delayed neurotoxicity of organophosphorus compounds. III.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 21(4): 661; 1979 (Japanese).

Each of five compounds, leptophos and its debrominated and chlorine-substituted derivatives, and EPN and its methyl-substituted derivative, were administered at single doses of 200, 100, 100, 50 or 100 mg/kg, respectively, to 1.6-2.5 kg, 20-mo-old hens. Three wk after administration the hens given leptophos, the debrominated derivative, or the chloro-substituted derivative exhibited delayed neurotoxicity. The hens given EPN and its derivative showed severe acute symptoms of intoxication, but did not exhibit symptoms of delayed neurotoxicity. When EPN was administered po 5 times within 2 wk for a total of 230 mg/kg to 10 hens, all exhibited gait disturbances within 2 wk after the last administration. Leptophos at 80 mg/kg and 150 mg/kg was administered to 1-wk and 4-wk-old chicks, respectively. No delayed neurotoxicity was observed. Delayed neurotoxicity symptoms were observed in 80% of the 6-mo-old hens given 200 mg leptophos/kg. All 20-mo-old chickens given 200 mg lepthophos/kg showed symptoms of delayed neurotoxicity.

80-0847. Hasegawa, H.; Sato, M.; Okonogi, K. (Inst. Ind. Med., Kawasaki, Kanagawa, Japan) **[On the toxicity of a pesticide, 1,2-dibromo-3-chloropropane (DBCP).]** *Sangyo Igaku (Jpn. J. Ind. Health)* 21(4): 661; 1979 (Japanese).

Male rats (age 14 wk) were continuously exposed to 0.3-10 ppm DBCP. Hypertrophy of the adrenals and marked weight reduction of the epididymis, the testes and the seminal vesicles were observed. A reduction in the number of spermatozoa present in the end of the epididymis, and reductions in the WBC count also occurred. Recovery was noted within 1-2 mo after exposure to 0.3-3 ppm DBCP. However, after DBCP exposure of 8-10 ppm, recovery of testes weight and the number of spermatozoa were not observed after 4 mo. The amount of DBCP present in the testes was not different from that in the blood or the liver at exposures less than 3 ppm. Pesticide levels in the testes rapidly increased at exposures of over 3 ppm. Impairment of sperm formation in the testes, and the inability to recovery this function may be caused by the presence of DBCP in the testes. The major toxicological actions of DBCP are considered to be abnormalities in sperm production, impairment of adrenal function, reduction of WBC, damage to intestinal mucosa, and carcinogenicity.

80-0848. Ishizu, S.; Momotani, H.; Sato, M.; Uchiyama, H. (Sch. Public Health, Tokyo Women's Med. Coll., Tokyo, Japan) **[On the acute intoxication due to methyl bromide.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 21(4): 662; 1979 (Japanese).

Methyl bromide, used to fumigate a warehouse, was detected 3 days after fumigation at levels of 200 ppm at the entrance of the warehouse. Back extrapolations indicate that a concentration of more than 15,000 ppm methyl bromide was used. Two deaths and 1 severe case of toxicity are reported from exposure to the methyl bromide in the warehouse. The acute symptoms appeared 56-57 hr after exposure. The amounts of bromide ion in the blood and urine of the surviving patient were 40-60 and 15-250 mg/l, respectively. The patient was unconscious from day 4 to 14, and suffered severe speech impairment sequela after exposure. Abnormal increases in GOT, LDH, CPK, and aldolase enzyme levels were also observed.

80-0849. Uchiyama, H.; Sato, M.; Momotani, H.; Morinobu, S.; Ishizu, S. (Sch. Public Health, Tokyo Women's Med. Coll., Tokyo, Japan) **[On the amount of bromide in the blood of animals exposed to aerial methyl bromide.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 21(4): 662-663; 1979 (Japanese).

Male white rabbits were exposed, in an exposing apparatus, to aerial methyl bromide once a week for 3 consecutive wk at respective concentrations of 50, 300 and 500 ppm. Blood samples were taken before, just after, and every other day after exposure to determine the amount of bromine absorbed. The maximum concentration of bromine in blood was 6, 20, and 20 mg/dl at 50, 300, and 500 ppm exposures, respectively. The final levels were reduced from the maximum concentrations, but were still higher than pre-exposure values; 2-4, 9-13, and 14-16 mg/dl at the 50, 300, and 500 ppm exposures, respectively. Bromine concentrations in internal organs (brain, liver, kidney and spleen) of the exposed animals, sacrificed 22 days after the last exposure, were not significantly different from controls.

80-0850. Ogata, M.; Ohkuma, K.; Ishii, K.; Hasegawa, T. (Sch. Public Health, Fac. Med., Okayama Univ., Okayama, Japan) **[Action of paraquat dichloride and nitrosoamine on the energy-converting system (II).]** *Sangyo Igaku (Jpn. J. Ind. Health)* 21(4): 663; 1979 (Japanese).

The actions of paraquat dichloride on oxidative phosphorylation, ATPase-activation, and the K factors were investigated. It was found that paraquat dichloride reduced regulatory control of oxidative phosphorylation, did not activate ATPase, and reserved the K+ factors. From these findings it is concluded that paraquat dichloride de-conjugates the electron transfer system in mitochondria, and the formation of a superoxide is induced by the oxidation-reduction of paraquat dichloride.

80-0851. Matsushita, T.; Aoyama, K. (Sch. Hyg., Fac. Med., Kagoshima Univ., Kagoshima, Japan) **[Examination of the dose-effect relationship on the occurrence of contact allergy by chemical substances.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 21(4): 668; 1979 (Japanese).

The occurrence of contact allergy was studied in female Hartley guinea pigs with maneb in pure water. Maneb sensitization was confirmed at concentrations of 2, 0.5, 0.2, and 0.05% at 2, 24, 48 and 2 hr, respectively. Maneb sensitization was most remarkable at 0.5% then at 0.05% and then at 5% by intracutaneous injections. A dose of 0.005% caused no reaction. Skin painting sensitization tests were concentration-dependent, except for 0.0025%. In patch tests using equal amounts, 8 x 10 mm patches showed reactions similar to those from 20 x 40 mm patches, but 2 x 4 patches gave relatively weaker reactions.

80-0852. Aoyama, K.; Matsushita, T. (Sch. Hyg. Fac. Med., Kagoshima Univ., Kagoshima, Japan) **[Studies for determining a method of contact-sensitization in the mouse.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 21(4): 668; 1979 (Japanese).

Thickening of the auricle was used to judge immunosensitization to test chemicals. One wk after painting a sensitizing substance on the back of mice or guinea pigs, the auricles were examined. Several treatments, such as sc injections using other sensitizing substances were also carried out to maximize the reactions. Dinitrofluorobenzene showed a strong, positive immunosensitivity when the treatments were supplemented by sc and ip administrations of zymosan. Maneb and thiram responses were not as strong.

80-0853. Kawauchi, T.; Yahagi, T.; Yoshikawa, K.; Kada, T.; Tanooka, H.; Ishidate, H.; Sasaki, M.; Sugiyama, T.; Tajima, Y.; Nakao, Y. (Natl. Cancer Cent. Japan, Tokyo, Japan) **[Development of screening techniques of carcinogenic substances based on their mutagenic properties.]** *Showa Nendo Koseisho Gan-kenkyu Niyoru Kenkyu Kokoushu* 2: 803-820; 1979 (90 references) (Japanese).

Results of screening studies on 25 chemicals, including malathion, chlorpyrifos, fenitrothion, Mitin FF, dicofol, Eulan U-33, and captafol, for mutagenic properties are reported. The methods included determinations of mutation, repair, chromosome aberration, and mutagenesis in the silkworm and in *Drosophilia.* Malathion tended toward positive in the mutation, repair and chromosome aberration tests. Fenitrothion showed a tendency to be positive in the mutation and chromosome aberration tests. The relative mutagenic activities of the chemicals were compared for each test and an overall ranking of the mutagenicity of the compounds was determined.

80-0854. Umemura, A.; Yasue, T.; Watanabe, S.; Kanbara, K.; Omae, M.; Osamura, Y.; Mori, H.; Amano, I.

(Dep. Circ. Syst., Gifu Prefect. Hosp., Gifu, Japan) **[A case of hemoperfusion therapy of acute organophosphate poisoning.]** *Sogo Rinsho (Clin. All Round)* 28(12): 2359-2363; 1979 (10 references) (Japanese).

A 37-yr-old man ingested approximately 150 ml of a 300 ml mixture of malathion, diazinon, and parathion and was hospitalized after being found in a semi-conscious state. Physical and clinical symptoms of acute organophosphate poisoning were noted. Blood gas analysis indicated reduced blood pH, BE at -7.0 mEq/l, SaO_2 at 56%, PaO_2 of 131 mm Hg and $PaCO_2$ of 31 mm Hg. Blood enzyme analysis results indicated elevated levels of GOT, GPT, LDH and serum amylase, and a significant reduction in cholinesterase levels. Hemoperfusion, hemodialysis, PAM, and atropine were administered. The patient recovered consciousness late in the day. Neurological abnormalities, pulmonary edema and abnormal light reflexes were not observed.

80-0855. Schwetz, B. A.; Ioset H. D.; Leong, B. K. J.; Staples, R. E. (Toxicol. Res. Lab., Health & Environ. Sci., Dow Chemical USA., Midland, MI 48640) **Teratogenic potential of dichlorvos given by inhalation and gavage to mice and rabbits.** *Teratology* 20(3): 383-388; 1979 (15 references).

Dichlorvos (2,2-dichlorovinyl dimethyl phosphate) is an important organophosphate insecticide and antihelmintic with widespread use. The purpose of this study was to evaluate the teratogenic potential of dichlorvos given orally at the maximum tolerated dose to mice (60 mg/kg/day) and rabbits (5 mg/kg/day) and by inhalation in both species at a concentration of 4 μg/l seven hr daily. Dichlorvos was not found to be teratogenic in either species by either route of administration. (Author abstract by permission)

80-0856. Freese, E.; Levin, B. C.; Pearce, R.; Sreevalsan, T.; Kaufman, J. J.; Koski, W. S.; Semo, N. M. (Lab. Mol. Biol., Natl. Inst. Health, Bethesda, MD 20205) **Correlation between the growth inhibitory effects, partition coefficients and teratogenic effects of lipophilic acids.** *Teratology* 20(3): 413-440; 1979 (86 references).

The inhibition of cell duplication by many lipophilic acids was measured in *Bacillus subtilis* and in the following mammalian cell lines, the human epithelial-type cell lines HeLa, strain R and strain L-132, the human fibroblast cell line VA-13, and the rat glial cell line C. The results were correlated to the partition coefficient and the distribution coefficient (= apparent partition coefficient at pH 7.2) of the compounds, using octanol/water partition coefficient and p*K*a values either from the literature or measured for this work. For *B. subtilis*, the logarithm of the inhibitory potency of most compounds increases linearly with the logarithm of the partition coefficient. Exceptional high potencies were observed for compounds that can efficiently delocalize the charge of the negative ion over the whole molecule. Most compounds inhibit tissue cultures at least as potently as they inhibit *B. subtilis*. But some compounds are significantly more potent in tissue cultures than would have been expected from the *B. subtilis* data; such compounds (analgesics/antipyretics, anti-inflammatory compounds, butyrate, norepinephrine) presumably inhibit mammalian cells by specific reactions with certain cell components. However, most compounds inhibit the different cell lines to a similar degree, indicating no cellular specificity; exceptions to this rule are chlorambucil, chlortetracycline and dexamethasone. Many of the lipophilic acids that are potent inhibitors of mammalian cell replication are also teratogenic. Exceptional compounds may not reach the embryo. We propose that a number of other lipophilic acids that are potent inhibitors to which humans are frequently exposed should be tested for their teratogenic effect. Teratogenicity data, LD50 values, uses, and physical, chemical, and inhibition data for 71 lipophilic acids (including 2,4-D; dicumarol; 2,4,5-T; and warfarin) are presented in tabular form. (Author abstract by permission)

80-0857. Murray, H. E.; Guthrie, R. K. (Dep. Chem., Texas A&M Univ., College Station, TX 77843) **Metabolic responses of aquatic bacterial populations to selected insecticides.** *Tex. J. Sci.* 31(4): 374; 1979.

In order to study metabolic responses, bacterial populations from a surface fresh-water reservoir were treated with 5 mg/l Sevin (carbaryl), or with malathion at 23, 28 and 33°C. Plate counts and O_2 uptake were used as indicators of metabolic activity. Both Sevin and its principal product, 1-naphthol, stimulated metabolic activity. Malathion suppressed metabolic activity to some degree. Selection seemed to occur for those populations which were able to metabolize malathion.

80-0858. Lowy, R.; Griffaton, G.; Brigant, L.; Ardouin, B.; Dupuy, F. (Lab. Biol., F-75141 Paris, France) **The dietary no-effect level of a dithiocarbamate fungicide, thiram, as evaluated from measurement data on rats. II. The various sensitivities of the various parameters.** *Toxicology* 14(1): 39-53; 1979 (17 references).

Young male Wistar rats were fed thiram for 29 day periods at dose levels of 225, 300, 450, 600, 900, and 1200 ppm (mg/kg diet). Thiram produced a decrease in all parameters measured with the exception of the adjusted weights of the liver and testes and the liver protein labelling, which were increased. A least significant dose level (LSD) was plotted for 11 of the parameters considered. The LSD for effect on testes and seminal vesicle wt was 420 ppm; LSD for decreasing body wt was 300 ppm. The most sensitive parameters studied were found to be the weights of the epididymal and perirenal fat pads (decreased by a 130-184 ppm thiram diet). The no-effect level observed did not differ significantly from the classical reported value of 48 ppm.

80-0859. Singhal, R. L. (Dep. Pharmacol., Fac. Health Sci., Sch. Med., Univ. Ottawa, Ottawa K1N 9A9, Canada) **Cyclic AMP in environmental toxicology.** *Trends Pharmacol. Sci.* 1(4): 100-102; 1979 (13 references).

The findings of recent research on the role of cyclic AMP as an intracellular mediator of the actions of certain environmental pollutants (heavy metals and halogenated hydrocarbon insecticides) are reviewed. The test chemicals used in these studies included *p,p'*-DDT, α-chlordane, heptachlor and endrin. Studies have demonstrated that exogenous cyclic AMP is able to mimic certain effects of DDT, cadmium, and lead on renal and hepatic carbohydrate metabolism. The influence of DDT on the adenylate cyclase-protein kinase system and methyl xanthine-induced potentiation of insecticidal action are summarized. Pharmacological modulation of cyclic ^{3}H AMP formation and changes in cellular growth following prolonged exposure to heavy metals are discussed.

80-0860. Pedersen, L. M.; Pedersen, P. B.; Lykkegaard, E. (Arbejdsmedicinsk Klin. Rigshospitalet, DK-2100 Copenhagen, Denmark) **Fire erhvervsbetingede fosfostigmiuforgiftninger. [Four cases of occupational phosphostigmine poisoning.]** *Ugeskr. Laeg.* 141(42): 2894-2896; 1979 (11 references) (Danish).

Four cases of accidental occupational poisoning by phosphostigmine (parathion) are reported. The poisonings occurred among 8-10 employees engaged in mixing and labeling concentrated organophosphorus insecticides at the same factory. One case occurred in 1964, the 3 others in 1977-1978. The patients included a 20-yr-old woman and 3 men aged 18, 28, and 51 yr, respectively. The poisoning was due to percutaneous exposure in all cases, and possibly exclusively to exposure to contaminated clothing in 1 case. Two patients were exposed to parathion, and 1 each to methyl parathion and mevinphos. The poisoning symptoms (nausea, emesis, and difficulty in breathing) occurred after the end of the workshift, and in 2 cases after latent periods of 6 and 12 hr, respectively. The patients from 1977-1978 were not informed about the hazards of percutaneous absorption and the poisoning symptoms. The symptoms were therefore attributed to food poisoning and the patients were not admitted to the hospital until 4, 6, and 20 hr after the first symptoms, respectively. No miosis was seen in 2 cases. All 4 patients were discharged after 1-4 days in good condition. There were no aftereffects, aside from mild paresis of the peroneal muscle in 1 case. The serum cholinesterase activity was measured in 3 cases: 0.4 μmol/min/ml was measured in 1 case during hospialization, 3.9 kU/l in another patient 12 days after the poisoning, and 1.9 kU/l in the third patient 3 days after the accident, but the enzyme activity returned to normal on day 8.

80-0861. NCI, Bethesda, MD 20014 **Bioassay of azobenzene for possible carcinogenicity.** *US NTIS PB Rep.* PB-239,835: 112 pg.; 1979 (21 references).

A bioassay of azobenzene for possible carcinogenicity was conducted by administering the test chemical in feed to F344 rats and B6C3F1 mice. Groups of 50 rats of each sex were administered azobenzene at one of two doses, either 200 or 400 ppm, for 105 or 106 wk. Matched controls consisted of 20 untreated rats of each sex. All surviving rats were killed at the end of administration of the test chemical. Groups of 50 male mice were administered azobenzene at one of two doses, either 200 or 400 ppm, for 105 wk. Groups of 50 female mice were administered the test chemical at one of two doses, initially 400 or 800 ppm, for 38 wk. It is concluded that under the conditions of this bioassay, azobenzene was carcinogenic (sarcomagenic) for F344 rats, including various types of sarcomas in the spleen and other abdominal organs of both males and females. The test chemical was not carcinogenic for B6C3F1 mice of either sex. (Author abstract by permission)

80-0862. Mills, W. L. (Dep. Energy, North Carolina Cent. Univ., Durham, NC) **Bioassay procedure to evaluate the acute toxicity of salinity and geothermal pollutants (pesticides) to *Gambusia affinis*. Final report.** *US NTIS PS Rep.* PS-790,109 pg. 8; 1979.

The salinity tolerance of *Gambusia affinis* was determined in static bioassays. *Gambusia* easily tolerated salinity of 47.5% in 96 hr static bioassays. Survival at this level was 93.3% with the lowest survival being 68% at 40% salinity. The acute toxicities of endrin, DDT, aldrin, and dieldrin to *Gambusia* were determined by static and intermittent-flow bioassays. Toxicity was measured as the Mediant lethal Concentration (TL50) for 96 hr exposures. TL50 values were lower in the intermittent-flow bioassays than in static bioassays. Residue concentrations were also compared in surviving and dead fish from the intermittent-flow bioassays. Residue concentrations in fish that died during tests were higher than those of fish that survived. However, the range of concentrations in dead and living fish overlapped. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0863. Kolaja, G. J.; Hinton, D. E. (Chem. Syst. Lab., Army Armament Res. & Dev. Command, Aberdeen Proving Ground, MD) **Ultrastructural alterations in the eggshell gland epithelium of the mallard duck after chronic exposure to DDT.** *US NTIS PS Rep.* PS-790,109 pg. 14; 1979.

This study was conducted to determine what effects the chronic ingestion of DDT would have on the ultrastructure of the eggshell gland of the mallard duck. The ultrastructure changes seen were edema of the type II epithelial cells as demonstrated by decreased electron density and vacuoles in the endoplasmic reticulum. Since the type II cells are responsible for the transport of calcium, alterations in these cells indicate that decreased calcium

transport may be responsible for DDT induced eggshell thinning. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0864. Parrish, P. R.; Dyar, E. E.; Enos, J. M.; Wilson, W. G. (Mar. Res. Lab., EG & G, Bionomics, Pensacola, FL) **Chronic toxicity of chlordane, trifluralin, and pentachlorophenol to sheepshead minnows (*Cyprinodon variegatus*).** *US NTIS PS Rep.* PS-790,109 pg. 24; 1979.

Sheepshead minnows (*Cyprinodon variegatus*) were exposed to 3 chemicals - chlordane, trifluralin, or pentachlorophenol (PCP) - in flowing, natural seawater to determine acute and chronic (full life-cycle) effects. Mortality of parental fish exposed to mean measured chlordane concentrations was significantly greater than that of control fish. Hatch of juveniles from embryos of exposed parental fish was significantly less than hatch of control juveniles. The estimated maximum acceptable toxicant concentration (MATC) was 0.5- 0.8 μg/l and the application factor (AF) limits, 0.04 - 0.06. Exposure to mean measured trifluralin concentrations of 9.6 μg/l significantly decreased growth of parental fish. Fecundity of exposed parental fish was significantly less than that of control fish. Survival and growth of second generation fish were significantly less than the control. The estimated MATC was 1.3 4.8 μg/l and the AF limits 0.007-0.025. Mortality of parental sheepshead minnows exposed to mean measured pentachlorophenol concentrations of 88 μg/l was significantly greater than mortality of control fish. The estimated MATC was 47 88 μg/l and the AF limits, 0.11-0.20. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0865. Caldwell, R. S. (Marine Sci. Cent., Oregon State Univ., Newport, OR) **Biological effects of pesticides on the Dunegrass crab.** *US NTIS PS Rep.* PS-790,109 pg. 33; 1979.

The toxicity of 9 pesticides to various life history stages of the Dunegrass crab, *Cancer magister*, was examined to establish the most sensitive life stage of the crab, and the highest concentration of each pesticide having no discernible effect on that most sensitive stage during prolonged exposures. The compounds tested were the insecticides carbofuran, chlordane, malathion and methoxychlor; the herbicides 2,4-D, DEF, propanil and trifluralin; and the fungicide captan. For each pesticide the zoeal stages were found to be the most sensitive in long-term tests, approximately 5-10 times and 10-100 times more sensitive than juvenile and adult crabs, respectively, and were also affected at lower concentrations than those that affected egg hatching and prezoel development. The maximum acceptable toxicant concentrations for continuous exposures of *C. magister* zoeae to each of the 9 pesticides are: methoxychlor, 0.005 μg/l; chlordane, 0.015 μg/l; malathion, 0.02 μg/l; carbofuran, 0.05 μg/l; captan, 2 μg/l; DEF, 4 μg/l; trifluralin, 15 μg/l; propanil, 80 μg/l; and 2,4-D 1000 μg/l. The toxicity of each of these pesticides to crabs is compared with literature reports of their toxicity to other aquatic species. [Abstract from Ecology of Insecticides Water Pollution] (Author abstract by permission)

80-0866. Badyugin, I. S.; Titova, N. N.; Khamitova, R. Ya.; Makarov, N. Ya. (Author address not given.) **Nespetsificheskie mekhanizmy deistviya antikholinesteraznykh FOS. [Nonspecific mechanisms of action of anticholinesterase organophosphorus compounds (OPC).]** *Voen. Med. Zh.* 4: 47-49; 1979 (Russian).

An attempt was made to evaluate the role of acetylcholinemia in the pathogenesis of poisoning with organophosphorus compounds (OPC). It was found that sc administration of a sublethal dose (10 mg/kg) of armine results in a stable increase in the level of acetylcholine in the rat brain against the background of the mild decrease of cholinesterase activity. Inoculation with OPC also caused increases in the levels of adrenaline and 5-oxytryptamine, and a decrease of ATP level in the brain tissue.

80-0867. Glukhova, L. G.; Vasilenko, T. E.; Apon, N. I.; Boreiko, N. P. (Dep. Gen. Chem., Med. Inst., Vinnitsa, USSR) **Funktsional'noe sostoianie pecheni pri ostrom vozdeistvii fozalona i despirolia. [Functional state of liver in acute exposure to phosalone and despirol.]** *Vrach. Delo* (10): 108-109; 1979 (Russian).

The effect of pesticides phosalone and Despirol (ENT-27154; chloroderivative of levulinic acid) on the bile-producing and enzymatic function of the liver was studied in albino rats. Animals were subjected to a single po administration of pesticides at 0.5 LD50 (the value of LD50 is 108 mg/kg for phosalone and 240-280 mg/kg for Despirol). Toxicity was evaluated on days 1, 3 and 5 of exposure. It was found that phosalone inhibited the rate of bile secretion from 4.1-5.0 mg/min to 2.9-4.1 mg/min and, as a result, decreased the amount of bile by 27.5%. Despirol did not change the bile-producing function of the liver. Phosalone increased activity of serum alanine aminotransfersase (A1AT) by 63.2% and asparate aminotransferase (AsAT) by 40%. Acute poisoning with Despirol resulted in a 2.4-fold increase of A1AT activity and 2.1-fold increase of AsAT activity. Morphological examination of the liver revealed marked hyperemia with foci of spot hemorrhages. Morphological changes were more pronounced in rats exposed to phosalone.

80-0868. Mangeot, B. L.; Slife, F. E.; Rieck, C. E. (Dep. Agron, Univ. Kentucky, Lexington, KY 40506) **Differential metabolism of metribuzin by two soybean (*Glycine max*) cultivars.** *Weed Sci.* 27(3): 267-269; 1979 (6 references).

Metribuzin-3-^{14}C [4-amino- 6-*tert*-butyl- 3-(methylthio)- *as*- triazin 5(4*H*)-one] was absorbed, translocated, and metabolized by both metribuzin tolerant (Essex) and metribuzin sensitive (Coker 102) soybean cultivars [*Glycine max* (L.) Merr.]. After 48 hr Coker 102 accumulated 40% greater metribuzin equivalents in the shoots than Essex, but Essex shoots contained only 29% as much unaltered metribuzin as Coker 102, 1.08 and 3.68 μg/g dry weight, respectively. Essex is resistant to metribuzin primarily owing to a capacity to rapidly detoxify metribuzin to DA [6-*tert*-butyl- 3-(methylthio)-*as*-triazin- 5(4*H*)-one], to at least seven unidentified metabolites which remained in the aqueous fraction, and to an insoluble fraction. The unidentified metabolites in the aqueous fraction constituted the major detoxified breakdown products in both cultivars. (Author abstract by permission)

80-0869. Martin, D. H.; Lewis, R. A. (Div. Biochem., Univ. Nevada, Reno NV 89557) **Alterations of nucleic acid and protein syntheses *in vivo* in the chick embryo mediated by captan.** *Xenobiotica* 9(9): 523-532; 1979 (21 references).

The objective of this investigation was to measure the *in vivo* effects of captan on DNA, RNA, and protein biosynthesis in limbs of developing chick embryos. Captan (12 ppm) was injected into eggs on day 4 of incubation and macromolecular syntheses were measured on days 8-14. Total DNA contents were unaffected by captan, but incorporation of [^{3}H]thymidine was inhibited over the entire time range; the period of peak specific activity (day 11) was inhibited in treated samples to 67% of control. Total RNA content was reduced in the earlier days but returned to normal by day 14, whereas incorporation of [^{3}H]uridine was lowered throughout the period. The timing of peak specific activity for RNA synthesis was delayed by 2 days in treated eggs and was inhibited by 32% when peak days were compared. Total protein concentration was slightly lowered by the captan treatment in the mid-range of the days measured, and the incorporation of [^{3}H]valine was retarded in the early days; peak periods of synthesis were similar in magnitude but were shifted from days 9-10 in control to day 11 in treated embryos. (Author abstract by permission)

80-0870. Lay, M. M.; Menn, J. J. (Dep. Biochem., Mountain View Res. Cent., Stauffer Chem. Co., Mountain View, CA 94042) **Mercapturic acid occurrence in fish bile. A terminal product of metabolism of the herbicide molinate.** *Xenobiotica* 9(11): 669-673; 1979 (20 references).

Molinate sulphoxide, an oxidation metabolite of molinate, is cleaved *in vitro* by Japanese carp liver cytosol fraction, indicating the presence of GSH-*S*-transferase activity, since cleavage of the sulphoxide is dependent on the amount of supernatant protein and GSH in the assay medium. Molinate mercapturate was identified as a major metabolite recovered from bile of carp treated with molinate. The structure of the mercapturate was established by co-chromatography with an authentic standard in 3 TLC systems and by mass spectrometry. (Author abstract by permission)

80-0871. Ackermann, H.; Beitz, H.; Dedek, W.; Grahl, K.; Rueffle, E.; Georgi, W.; Reinhardt, R. (Zentralinst. Ernahr., DDR-1502 Bergholz-Rehbrucke, DDR) **Zur hygienisch-toxikologischen Beurteilung von Butonat. [Hygienic and toxicological examination of butonate.]** *Z. Gesamte Hyg. Ihre Grenzegeb.* 25(7): 512-518; 1979 (German).

A complex hygienic and toxicological assessment of butonate is presented on the basis of a review of the literature. The oral LD50 was found to be 1050-1600 mg/kg in rats, 760 mg/kg in mice, 950 mg/kg in guinea pigs, 210 mg/kg in hens, and > 100 mg/kg in birds. The dermal LD50 is > 2000-7000 mg/kg in rats, and 3080 mg/kg in rabbits. The subcutaneous LD50 is 700-3000 mg/kg in rats. The ip LD50 in the rat is 700-780 mg/kg. The MAC is 2 mg/m^3. The half-life of butonate in fruits and vegetables is 0.5-1.5 days. The necessary waiting period after treatment is 3-7 days for general-purpose crops, and 10 days for crops to be used in baby food and dietetic preparations. In abiotic aquatic media butonate is decomposed to trichlorfon, demethyl trichlorfon, and demethyl butonae at pH < 5.5, and primarily to vinyl butonate, demethyl butonate, and demethyl vinyl butonate at pH > 5.5. In plants butonate is degraded by enzymatic deacylation, or enzymatic demethylation. In warm-blooded organisms trichlorfon and dichlorvos are formed by enzymatic deacylation, and vinyl butonate by dehydrohalogenation. The LC50 is 5-20 mg/l for some fishes, 5 mg/l for guppies, and > 1,000 mg/l for *Daphnia* and bacteria. The MAC of butonate is 20 μg/ml in drinking-water, 40 μg/ml in raw water to be used for drinking-water preparation, and 500 μg/ml for bath water.

80-0872. Thiemann, K. G. (Bezirksinst. Veterinarwesen Cottbus, DDR-75 Cottbus, DDR) **Zum Rueckstandsverhalten von Butonat in Huehnereiern. [Residue dynamics of butonate in hen's eggs.]** *Z. Gesamte Hyg. Ihre Grenzgeb.* 25(7): 519-521; 1979 (9 references) (German).

The residue dynamics of butonate, trichlorfon, and dichlorvos was studied on the surface and in the egg-white of 500 residue-free, fresh eggs immersed in solutions of butonate [Pedix PE 50, 2.7 (v/v), and Pedix-Butonate (2.5% (v/v)] for 1 sec. The eggs were then stored at 291°K or 273°K. The surface contamination with trichlorfon and dichlorvos dropped to below the detection limit after 9 days of storage at 291°K following treatment with Pedix-Butonate. Butonate was not detectable on day 10. At

273°K, dichlorvos and trichlorfon were detectable until day 22, butonate until day 25. No residues were detectable after 8-9 day storage at 291°K following treatment with Pedix PE 50. At 273°K, the residues disappeared in 29-33 days. No residues were found in the eggwhite within the first 3 days after treatment with Pedix-Butonate. At 273°K, the butonate level in the eggwhite reached its maximum (0.012 ppm) on day 7, to drop to 0.005 ppm on day 10. No butonate residue was detectable on day 12. After treatment with Pedix PE 50, the butonate level in the eggwhite reached 0.01 ppm on day 4, but only traces of trichlorfon and dichlorvos were found. No residues were detectable on day 8 at 273°K. The residues were eliminated more rapidly at 291°K.

See also 80-0602, 80-0605, 80-0609, 80-0614, 80-0616, 80-0617, 80-0618, 80-0619, 80-0620, 80-0625, 80-0628, 80-0629, 80-0630, 80-0631, 80-0632, 80-0633, 80-0634, 80-0635, 80-0636, 80-0637, 80-0638, 80-0639, 80-0640, 80-0641, 80-0642, 80-0643, 80-0644, 80-0645, 80-0651, 80-0652, 80-0653, 80-0654, 80-0655, 80-0656, 80-0664, 80-0670, 80-0673, 80-0674, 80-0682, 80-0684, 80-0693, 80-0718, 80-0729, 80-0734, 80-0735, 80-0736, 80-0740 *and* 80-0742.

80-0873. Szelewski, M. J.; Hill, D. R.; Spiegel, S. J.*; Tifft, E. C., Jr. (O'Brien & Gere Eng. Inc., Syracuse, NY 13221) **Loss of polychlorinated biphenyl homologues during chromium trioxide extraction of fish tissue.** *Anal. Chem.* 51(14): 2405-2407; 1979 (4 references).

Chromic acid treatment was used during the analysis of freshwater and marine fish for contamination with PCBs, to eliminate organochlorine pesticide interference. During the procedure, changes in the Aroclor gas chromatographic patterns were noted which included not only changes in expected peak areas but also the loss of several PCB homologues. The extent of these effects were then investigated under controlled conditions. It is suggested that the PCB homologues were lost either by oxidation concurrently with pesticide residues, by volatilization due to the highly exothermic nature of the oxidative process, or due to a combination of the two.

80-0874. Hollies, J. I.; Pinnington, D. F.; Handley, A. J. (Res. & Dev. Dep., ICI Ltd., Runcorn, Cheshire WA7 4QD, England) **The determination of chlorinated long-chain paraffins in water, sediment and biological samples.** *Anal. Chim. Acta* 111: 201-213; 1979 (5 references).

Methods are described for the routine determination of traces of industrial chloro- n- paraffins having 13-30 carbon atoms and chlorine contents of 42-45% (w/w), in environmental samples of water, sediments and biota. The procedures are based on thin-layer chromatography detection and measurement. All samples are cleaned up by liquid-solid adsorption chromatography and thin-layer chromatography but those rich in lipids require preliminary solvent extraction. The methods distinguish between chloro- n- paraffins based on long carbon chains (C_{20}-C_{30}) and those based on shorter chains (C_{13}-C_{17}). The methods cover the ranges 500 ng/l to 8 μg/l for water (i.e. from about the solubility limit upwards) and 50 μg/kg to 16 mg/kg for sediments and biota. The precision of the methods ranges from ± 50% relative at the lowest concentrations to + 12% relative at the highest. Recoveries are about 90% for water, 80% for sediments and between 80 and 90% for biota according to sample type. Interference from organochlorine insecticides was determined to not occur after Rf value comparisons. (Author abstract by permission)

80-0875. Clark, E. R.; Qazi, I. A. (Dep. Chem., Univ. Aston Birmingham, Gosta Green, Birmingham B4 7ET, England) **Modified colorimetric method for the determination of malathion.** *Analyst (London)* 104(1245): 1129-1134; 1979 (12 references).

A thorough investigation has been made of the recommended method for the determination of malathion, and the major cause of two of the most serious problems in this method has been resolved. The method that uses a copper (II) complex as the basis of colorimetric measurements suffers from the disadvantage that the color fades quickly and that an increase of a few seconds in the contact time of the copper(II) solution and the hydrolysis product of malathion results in a reduction in the intensity of the yellow color. Attempts to overcome these drawbacks have been reported, some of which are tedious and others only partially successful, but it is suggested that if copper is replaced with bismuth the problems may be more simply resolved. Isomalathion does not react in this method. (Author abstract by permission)

80-0876. Suett, D. L.; Wheatley, G. A.; Padbury, C. E. (Nat. Veg. Res. Stn., Wellesbourne, Warwick CV35 9EF, England) **Preparation and stability of dilute insecticide analytical standards for gas chromatography.** *Analyst (London)* 104(1245): 1176-1180; 1979 (4 references).

A convenient and economical procedure for preparing and storing accurately measured amounts (1.00 mg) of insecticide analytical standards is described. The validity of the method was evaluated in a 2-yr study of the storage stability of carbofuran, chlorfenvinphos, diazinon, dichlorvos (DDVP), disulfoton and disulfoton sulfone. Solutions (1 mg/ml) of each insecticide were prepared in hexane, toluene or acetone and aliquots sealed in glass ampoules were stored at -20, 1 and 20°C. After 0.25, 0.5, 1.0 and 2.0 yr the mean concentrations of all compounds, except dichlorvos were within 0.9% of fresh solutions of the original standards; dichlorvos was 3.6% greater. Neither the type of solvent nor the storage temperature had significant ($P = 0.05$) effects of the concentrations but there were large differences in purity between different batches of primary standards of all the organophosphorus insecticides. (Author abstract by permission)

80-0877. Debska, W.; Gnusowski, B.; Zygmunt, B. (Dep. Phytochem. Anal., Inst. Med. Plants, PL-61707 Poznan, Poland) **Determination of oxycarboxin residues in medicinal plants.** *Analyst (London)* 104(1245): 1191-1194; 1979 (10 references).

Oxycarboxin treated plant samples (10 g) are blended with 100 ml acetone. The filtered extracts are evaporated to dryness then hydrolyzed in an alkaline medium to convert the oxycarboxin to an aniline residue. The aniline is steam distilled, adjusted to pH 7.2 and mixed with benzene. The benzene layer, washed three times with 7.2 pH water, is diazotized and coupled with *N*-1- naphthyl ethylene diammonium chloride to form a colored complex. The samples are colorimetrically examined at 558 nm. The percent recoveries were 64-65% in treated leaves. The method will yield false positives in crop samples contaminated by chemicals containing an aniline group, such as the carboxanilide fungicides, substituted urea herbicides and carbamates.

80-0878. Pavoni, G. (Lab. Chim. Prov. Bologna, I-40138 Bologna, Italy) **Ricerca di glifosate e del suo metabolita principale, l'acido amminometil fosfonico per TLC. [TLC study of glyphosate and its principle metabolite, aminomethyl phosphonic acid.]** *Boll. Lab. Chim. Prov.* 4(9): 157-161; 1978 (7 references) (Italian).

A simple and sensitive TLC method for the determination of glyphosate and its principal metabolite, aminoethyl phosphonic acid (AMA) in soil and water is described. Following extraction with ammonium hydroxide, and clean-up on a column filled with Dowex 1-x8 (20-50 mesh), determination is done on a silica gel layer, using n-butanol-anhydrous acetic acid-water (6:2:2) as the solvent system, and ninhydrine as the spray reagent. Glyphosate and AMA give bluish violet spots with the respective R_f values of 0.18 and 0.40. The 2 compounds are distinguished by spraying the plate first with reagent A (ammonium molybdate in hydrochloric acid, containing perchloric acid), and then with reagent B (Gentian violet in deionized water containing ammonium molybdate, mixed with hydrochloric acid) to detect phosphorus. The sensitivity of the method is 0.05 ppm for soil samples and 0.01 ppm for water samples.

80-0879. Molinari, G. P.; Del Re, A. (Ist. Chim. Org. Fac. Agrar., Univ. Cattol. Sacro Cuore, Piacenza, Italy) **Residui di antibotritici in uve, mosti e vini. II. Determinazione gascromatografica di Sumisclex. [Anti-botrytis residues in grapes, must and wines. II. Gas liquid chromatographic determination of Sumisclex.]** *Chim. Ind. (Milan)* 61(2): 98-100; 1979 (9 references) (Italian).

The GLC determination of Sumisclex (procymidone) in grapes, must, and wine is described. Benzene containing 4 μg/ml 4,4′- dichlorodiphenyl as an internal standard is used for extraction. The dried extract is analyzed directly without clean-up, using a gas chromatograph with an electron-capture detector. The detector temperature is 260°C, the column temperature 190°C. The column filling is Chromosorb W, AW-DMCS 80-100 mesh with 5% QF-1. In the concentration range of 0.1-20 ppm, the recovery rate from grapes, must, and wine is 99 ± 2.6%. The limit of detection is 0.05 ppm. The relative retention time (4,4′- dichlorodiphenyl = 1.0) is 8.1, compared with 14.1 for captafol, 3.5 for vinclozolin, 4.0 for dichlofluanide, 5.0 for folpet, and 5.6 for captan.

80-0880. Murray, D. S.; Santelmann, P. W. (Dep. Agron., Oklahoma State Univ., Stillwater, OK 74074) **Are herbicides present.** *Crops Soils* 32(4): 12-14; 1980.

A bioassay method for the presence of herbicides in soil is discussed. Specific test species are planted in soil samples. After the plant species sprout injury symptoms appear if herbicide residues are present. The specific injury symptoms indicate which herbicide residues are present in the soil. Substituted urea and s-triazine type herbicides were found to cause leaf yellowing and death. Root stunting or injury may be due to use of the dinitroanilines. A list of test species to be planted for the detection of specific herbicide families (acetanilide, benzoics, carbamates, dinitroaniline, phenoxys and relatives, phenols, triazines or uracil) is included.

80-0881. Sekita, H.; Takeda, M.; Uchiyama, M. (Natl. Inst. Hyg. Sci., Tokyo, Japan) **[Studies on analysis of pesticide residues in foods. 29. Analytical method for hexachlorobenzene (HCB) in fat-containing foods.]** *Eisei Shikenjo Hokoku (Bull. Natl. Inst. Hyg. Sci.)* 97: 129-135; 1979 (5 references) (Japanese).

Hexachlorobenzene (HCB) content in dairy products, meat, and fish was determined by column chromatography and gas chromatography (GC) with electron capture detection (ECD). HCB was cleaned up on a 20 g, 2.2, cm i.d. Florisil column. Almost all of the HCB was eluted in the first fractions (200 ml) from the *n*-hexane: ether (94:6) eluate system. BHC isomers, DDT isomers, aldrin, and heptachlor epoxide were also extracted in these fractions. Dieldrin and endrin could be eluted later by a 70:30 mixture of *n*-hexane: ether. Acetonitrile partitioning gave 95% recovery of HCB from fatty samples. GC-ECD columns packed with 1.5% QF-1 and 5% OV-17 were found to be the most suitable for determining HCB in fat-containing foods. Recoveries from fortified milk, chicken, and sardine samples were about 90%. The minimum detection level of HCB was 0.002 ppm on a fat basis.

80-0882. Wing, K. D.; Hammock, B. D. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Stereoselectivity of a radioimmunoassay for the insecticide S-bioallethrin.** *Experientia* 35(12): 1619-1620; 1979 (17 references).

The stereoselectivity of a radioimmunoassay (RIA) system using an S-bioallethrin specific antiserum was studied by observing the ability of the 8 allethrin isomers and other selected compounds to compete with a radiolabelled S-bioallethrin tyramine derivative for antibody binding sites. The results demonstrate the feasibility of RIA as a rapid, sensitive and stereoselective residue technique for compounds difficult to analyze by classical methods. (Author abstract by permission)

80-0883. Huether, G.; Luppa, H. (Div. Biol. Sci., Karl Marx Univ. Leipzig, DDR-701 Leipzig, DDR) **The multiple forms of brain acetycholinesterase. III. Implications for the histochemical demonstration of acetylcholinesterase.** *Histochemistry* 63(1): 115-121; 1979 (27 references).

Polyacrylamide gradient micro-gel electrophoresis was used to investigate the multiple forms of acetylcholinesterase (AChE). Frozen sections of rat spinal

cord or bovine caudate nucleus were homogenized and centrifuged, with the clear supernatant being used for electrophoresis. Following electrophoresis and prior to incubation, the micro-gels were exposed to the fixative formaldehyde or the inhibitor DFP. Results indicated that the standard histochemical method for AChE preferentially demonstrates the high molecular forms, with most of the oligomer forms being washed out or inactivated. It was shown that inhibition of the oligomers with DFP selectively demonstrated the highly aggregated forms.

80-0884. Blanchet, P. F. (Groupe Rech. Insectes Piqueurs, Dep. Chim. Biol., Univ. Quebec, Trois-Rivieres, Quebec G9A 5H7, Canada) **Use of hexane for the quantitative recovery of organophosphorus pesticides from aqueous solution. A field method and a preservation technique.** *J. Chromatogr.* 179(1): 123-129; 1979 (22 references).

A general method for extraction, preservation and analysis of aqueous solutions containing traces of organophosphorus pesticides has been developed. Samples of water (natural and distilled) were extracted by high-speed stirring after addition of a small volume of hexane to the sample. Extracts of lower concentration were concentrated by evaporation prior to analysis by flame photometric gas chromatography to yield a detection limit of 1 ppb in most instances. Extraction by this method has been successful for 13 of the 16 organophosphorus pesticides used in this study with an efficiency of better than 95% under the experimental conditions described. The extracts from all aqueous solutions were found to be relatively stable for 45 days. Recent developments in the preservation techniques are compared with ours and the advantages of all techniques are discussed. (Author abstract by permission)

80-0885. Lokke, H. (Dep. Pestic. & Contam., Natl. Food Inst., DK-2860 Soborg, Denmark) **Investigations on loss of chlorothalonil, dichlofluanid, tolylfluanid and vinclozolin by column chromatographic clean-up on silver-loaded alumina in a gas chromatographic multiresidue procedure.** *J. Chromatogr.* 179(2): 259-270; 1979.

The loss of the fungicides chlorothalonil, dichlofluanid, tolylfluanid and vinclozolin during column chromatography on alumina was found to be dependent on temperature, contact time, pH, deactivation by water and loadability of the column material. Silver nitrate added to the column material increased the loss of chlorothalonil, probably by the formation of charge transfer complexes between chlorothalonil and silver ions. The addition of substrate reduced the loss of compounds. On the basis of the experiment results an alumina clean-up procedure is proposed for multiresidue determination of chlorinated pesticides in fruit and vegetables. By rapid elution with 30% diethyl ether-light petroleum (b.p. 50-60°C) at 0°C from a chilled microcolumn consisting of 1 g of neutral alumina standardized with 7% water and loaded with 1% silver nitrate, recoveries better than 90% were obtained for the compounds tested. (Author abstract by permission)

80-0886. Ernst, G. F.; Heutink, R.; Verveld-Roeder, S. Y. (Food Insp. Serv., NL-3552 AS Utrecht, The Netherlands) **Gas chromatographic determination of bupirimate in apples and pears.** *J. Chromatogr.* 179(2): 351-354; 1979 (3 references).

A direct method for the determination of the systemic fungicide bupirimate in apples is described. Column chromatography can be used to clean up the sample. Dryed samples were dissolved in 1 ml ethyl acetate. Either a Tracor MT-220 gas chromatograph with a Melpor 200 AT flame photometric detector (sulfur mode) or a Hewlett-Packard 5710 A gas chromatograph with a dual nitrogen-phosphorus flame ionization detector (nitrogen mode) was used. Gas-Chrom Q 60-80 mesh with 10% OV-101 was used. The injector temperatures were 225°C and 250°C, the detector temperatures were 200°C and 300°C, and carried gases were nitrogen and helium, respectively for the Tracor and Hewlett-Packard machines. Averaging 5 recovery experiments with both detectors at 3 concentrations of 0.05-0.3 mg bupimirate/kg gave 97.4-98.6% recovery. The limit of detection for both chromatographs was approximately 0.02 mg/kg. Interference in uncleaned samples was dependent on apple variety. For screening or routine determinations clean up can be omitted.

80-0887. Cabras, P.; Meloni, M.; Perra, M.; Pirisi, F. M.* (Fac. Farm., Univ. Cagliari, I-09100 Cagliari, Italy) **Reversed phase high performance liquid chromatography of fungicides. Determination of vinchlozolin in presence of benomyl, BMC, and methyl-thiophanate.** *J. Chromatogr.* 180(1): 184-190; 1979 (17 references).

The separation of four fungicides, vinchlozolin, benomyl, thiophanate methyl and BMC (a degradation product of benomyl and thiophanate methyl), and the quantitative determination by reversed-phase high-performance liquid chromatography in samples extracted from field sprayed grapes are described. The optimum wavelength for simultaneous UV determination was found to be 221.0 nm. The mobile phase was a mixture of distilled water and acetonitrile; 55/45 was found to be the optimum proportion. A calibration curve was constructed for each fungicide. Approximately 2 kg of field sprayed grapes were milled and 200 ml of the homogenate was shaken twice with 200 ml of purified light petroleum ether for 30 min. The organic layers were dried, and the residue was then dissolved in 1 ml of acetonitrile containing the internal standard. The separation was found to be dependent on the water content of the mobile phase, the temperature and buffer pH. Although increased temperatures gave lower retention times, they also caused peak overlap. The percent

recovery of known amounts of fungicide (after two extractions) ranged from 50% for 25 ppm vinchlozolin to 94% for 25 ppm BMC. Sensitivities were 0.01 ppm for BMC and 0.05 ppm for the other three fungicides. The method is suggested for rapid, routine, quantitative determinations of these fungicides in foodstuffs at residue levels below those permitted on foodstuffs in Italy.

80-0888. Houtermans, W. J.; Boodt, C. P. (GL Lab., Chrompack Nederland bv., NL-4330AA Middelburg, The Netherlands) **Increased thermostability of non-polar wall-coated open tubular columns.** *J. High Resolut. Chromatogr. Chromatogr. Commun.* 2(5): 249-250; 1979 (5 references).

A method is described for the deactivation of the inner surfaces of glass capillary columns used in wall-coated open tubular column technology. Deactivation is necessary, especially for polar compounds, since the untreated glass walls show high adsorption properties. In this method, a non-polar liquid phase, which can withstand 350°C for temperature programmed analysis was prepared from a dimethyl polysiloxane phase, CP-Sil-5 (Chrompack) prepared from normal SE-30 (General Electric) and then statically coated on the glass surface. The column was then conditioned and standard tests were carried out on a gas chromatograph. Results are given for a mixture of the chlorinated pesticides, α-BHC, β-BHC, HCB (hexachlorobenzene), α-BHC (lindane), aldrin, *o,p'*-DDE, α-endosulfan, *p,p'*-DDE, dieldrin, *o,p'*-DDD (TDE), endrin, β-endosulfan, *p,p'*-DDD (TDE), *o,p'*-DDT, and *p,p'*-DDT. By this method, columns were prepared reproducibly with coating efficiencies of between 80 and 100%. Inertness was apparently stable at 350°C, with thermostability of the liquid phase film between 325°C and 350°C.

80-0889. Tuinstra, L. G. M. Th.; Traag, W. A. (State Inst. Qual. Control Agric. Prod., Bornsesteeg 45, 6708 PD Wageningen, The Netherlands) **Automated glass capillary gas chromatographic analysis of PCB and organochlorine pesticide residues in agricultural products.** *J. High Resolut. Chromatogr. Chromatogr. Commun.* 2(12): 723-728; 1979 (15 references).

The use of glass capillary gas chromatography to separate complicated PCB mixtures into individual compounds, and to separate and determine organochlorine pesticides, is presented. Organochlorine pesticides detected with this method included, HCB (hexachlorobenzene), PCNB (quintozene), PCA (chloridazon), α-HCH (lindane), heptachlor epoxide, aldrin, telodrin (isobenzan), isodrin, dieldrin, endrin, α-HCH (α-BHC), and ΣDDT. Use of this technique to determine the contents of individual chlorinated biphenyls in milk and milk products, animal feedstuffs, complicated extracts of soil and vegetable material is discussed. The study of DDT degradation using this system is considered. The detection limit for individual chlorinated biphenyls in fats and vegetable materials, using an extraction and clean-up procedure based on saponification of the sample, is found to be at the ppb level. Preliminary results of the analysis of milk samples from the Netherlands for PCB residues are also presented.

80-0890. Baranov, Yu. S.; Khilik, L. A.; Klisenko, M. A. (All-Union Res. Inst. Essent. Crops, Simferopol, USSR) **Opredelenie *sym*-triazinovykh gerbitsidov v efirnykh maslakh i rasteniak [Determination of *S*-triazine herbicides in essential oils and plants.]** *Khim. Sel'sk. Khoz.* 17(6): 57-59; 1979 (14 references) (Russian).

A method of gas chromatographic determination of residues of *S*-triazine herbicides in essential plants and oils is described. The method is based on isolation of herbicides from plant samples with acetone, purification of extracts with diluted hydrochloric acid, and re-extraction from alkalized solution with chloroform. The extractability of herbicides was found to be 74-77%. Determination of herbicides in the samples of essential oils was carried out by partition chromatography. Sensitivity of the assay ranged from 0.1 to 0.2 mg/kg; detectability of herbicides (atrazine, simazine, Igran (terbutryne), and prometryne) was found to be 70-90%.

80-0891. Kofman, I. Sh.; Kofanov, V. I. (Inst. Plant Physiol., Kiev, USSR) **O primenenii metoda vnutrennego standarta pri gazokhromatograficheskom opredelenii mikrokolichestv pestitsidov. [Use of internal standard method for GLC determination of trace amounts of pesticides.]** *Khim. Sel'sk. Khoz.* 17(9): 60-61; 1979 (3 references) (Russian).

The advantages of the use of an internal standard during the gas chromatographic determination of trace amounts of pesticides are discussed. The technique was used for determination of the pesticide Treflan (trifluralin) in water and soil. Methanol and n-hexane were used for extraction of Treflan from the soil and water, respectively. Treflan-containing extracts were concentrated in the presence of keeper (0.5-2 ml of hexadexan). The retention time for Treflan was 6 min, compared to 9 min for lindane (internal standard). The minimally detectable amount of Treflan was 0.1 ng.

80-0892. Henshall, A. (Appl. Lab., Spectro-Phys., Santa Clara, CA 95051) **New approaches to HPLC method development in the food and beverage industry.** In: *Liquid Chromatography Analysis of Food and Beverages.* Charalambous, G., ed. (Acad. Press: NY) 1: 31-48; 1979 (28 references).

New methods of high-pressure liquid chromatography (HPLC) are described for use in the food

and beverage industry. A Spectra-Physics SP 800 HPL Chromatograph fitted with a Spectra-Physics SP 8310 UV/visible detector combined with a micro programmer, was used in all studies described. First, optimization of reverse-phase separations by replacement of the two-solvent gradient method with ternary solvent programming, which uses only one solution, is described. Second, controlled reverse-phase separation by modification of the mobile phase selectivity is described. Third, the use of ternary solvent programming for on-column concentration of trace components in water or aqueous solutions is described. As an example, ternary solvent programming was used for the elution of carbaryl and DDT from tap water. Finally, on-column clean-up was carried out using a multiple series of columns.

80-0893. Gast, R. (Bayer. Landesanst. Wasserforschung, Munich, BRD) **Versuche zur quantitativen PCB-Bestimmung. [Studies into quantitative PCB determination.]** *Muench. Beitr. Abwasser-, Fisch.- Flussbiol.* 30: 215-225; 1978 (7 references) (German).

Studies on the quantitative determination of PCBs in water are presented. A gas chromatograph with a ^{63}Ni detector was used for the determination; the column filling was Chromosorb G-HP 80-100 mesh with 10% OV 1. The comparison of 3 different extraction methods (2 laboratory methods with manual and mechanical shaking, respectively, and continuous liquid-liquid extraction on 2 columns with hexane) showed good recovery rates with the manual and mechanical shaking techniques (97% and 102%, respectively). The 2-column extraction method was found to be unsuitable for quantitative determination due to recovery rates for the individual components ranging from 5% to 100%. Experiments with recipient water containing microflora and microfauna, to which PCB was added (2 µg/l), demonstrated that the PCB pattern was subject to changes as a function of time.

80-0894. Horiba, M.; Kobayashi, A.; Abe, H.; Murano, A. (Inst. Biol. Sci., Sumitomo Chem. Co. Ltd., Takarazuka, Japan) **[Gas chromatographic and colorimetric methods for the determination of a new organophosphorus herbicide, 0-ethyl 0-(3-methyl- 6-nitrophenyl) *N-sec*-butyl phosphoro amidothioate (Cremart) in technical preparations and formulations.]** *Nippon Nogei Kagaku Kaishi (J. Agric. Chem. Soc. Jpn.)* 53(4): 111-115; 1979 (6 references) (Japanese).

Gas chromatographic (GC) and colorimetric determination methods for the organophosphorus herbicide Cremart were developed. A 2% silicone OV-225 column at a temperature of 200°C, using di-2-ethylhexyl phthalate as an internal standard, was used to determine Cremart by GC. For colorimetric determination absorbance at 420 nm was measured to find 3-methyl-6- nitrophenol content. The amount of free 3-methyl-6- nitrophenol in a Cremart sample was determined. The sample was then hydrolyzed in 2.5 *N* potassium hydroxide solution to 3-methyl-6-nitrophenol, and total 3-methyl-6- nitrophenol was determined. Cremart content was calculated after subtracting free 3-methyl-6- nitrophenol from total 3-methyl-6-nitrophenol. The 2 methods obtained similar values.

80-0895. Hass, J. R.; Friesen, M. D.; Hoffman, M. K. (Environ. Biol. & Chem. Branch, Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709) **The mass spectrometry of polychlorinated dibenzo-*p*-dioxins.** *Org. Mass Spectrom.* 14(1): 9-16; 1979 (15 references).

The mass spectral behaviors of polychlorinated dibenzo-*p*-dioxins are described. The oxygen negative chemical ionization gives 2 reaction types of fragments which are described. Methane negative ion chemical ionization mass spectra are dominanted by ions corresponding to the loss of H, Cl, and Cl_2. Methane positive ion chemical ionization mass spectra contain the protonated molecular ion as its base peak. The other peaks are from loss of Cl, H, and combinations of the 2 from either the protonated or $(M + C_2H_5)+$ ions. The methane/oxygen negative ion chemical ionization mass spectra were found to be the best methods for structure determinations.

80-0896. Kadam, A. N.; Bendre, S. B.; Ghatge, B. B. (Natl. Chem. Lab., Poona 411008, India) **Gas chromatography of technical chlordane and identification of some of the components.** *Pesticides* 12(3): 13-15; 1978 (6 references).

Technical chlordane, a mixture of polychlorinated dicyclopentadienes, was analyzed by gas chromatography-mass spectrometry (GC-MS). Analyses were performed on an AIMIL-NCL Dual Column GC, using 930mm x 2mm aluminum columns packed with 60-80 mesh chromosorb W. GC-MS was performed on an AEI-MS unit with 930mn x 2mm glass columns with 3% SE-30, coated on 60-80 mesh chromosorb W. Twenty-one peaks were identified, including 10 components of the low boiling fractions. Among the newly identified components were carbon tetrachloride, hexachloro cyclopentadiene, adduct of cyclopentadiene and *n*-heptane, tetrachloro dicyclo pentadienes, and pentachloro dicyclo pentalienes.

80-0897. Stewart, M. J. (Toxicol. Unit, Dep. Clin. Chem., R. Infirm., Edinburgh EH3 9YW, Scotland) **The role of HPLC in the investigation of the poisoned patient.** *Proc. Anal. Div. Chem. Soc.* 16(10): 297-300; 1979 (15 references).

Some compounds that require quantitative evaluation before treatment of poisoning can be determined by high pressure liquid chromatography. In salicylate, paracetamol, iron, lithium, quinine and phenobarbitone

poisoning, HPLC has been shown to be useful. Paraquat was not successfully determined by HPLC. The suggested method for rapid quantiative determination of paraquat is ion-exchange chromatography after ion-pair extraction.

80-0898. Goto, M.; Soda, T. (Shimane Prefect. Lab. Environ. Pollut. & Public Health, Matsue, Ahimane, Japan) **[Microanalysis of diphenyl and ortho-phenylphenol in fruit juices of citrus.]** *Shimane-ken Eisei Kogai Kenkyusho Gyoseki Hokoku (Res. Rep. Shimane Prefect. Public Health Lab.)* 20: 90-91; 1978 (1 reference) (Japanese).

Results of mass spectrometric microanalyses of diphenyl (biphenyl) and *o*-phenylphenol in 6 fruit juice samples are reported. GC was conducted on columns of 1% silicone OV-I chromosorb W (60-80 mesh) at column temperatures of 150°C for diphenyl, and 160°C for *o*-phenylphenol. The inlet temperature was 200°C, the helium carrier gas flow was 20 ml/min and a TIC detector was attached. The acceleration for MS was 3500 V, the ionization voltage was 70 eV and the ion temperature source was 270°C. For diphenyl m/e = 154, and for *o*-phenylphenol m/e = 170, were used as reference peaks. Calibration curves showed favorable linearity for diphenyl at 0.2-2 ng, and for *o*-phenylphenol at 1-5 ng. Diphenyl residues of 16.7, 1.7, ND, trace, 7.3 and 2.7 ppb; and *o*-phenylphenol residues of 7.3, 2.7, ND, trace, 4.7 and 6.7 ppb, respectively, were detected from the 6 commercially available imported citrus juice samples.

80-0899. Dickes, G. J. (Avon Cty. Lab., Bristol, England) **The application of gas chromatography to food analysis.** *Talanta* 26(12): 1065-1099; 1979 (518 references).

The literature on the uses of gas chromatography (GC) in food analysis is reviewed. The impact that food analysis has had on improving GC techniques is discussed, and it is pointed out that pesticide-residue analysis provided the impetus for the development of electron capture, alkali metal flame ionization, flame-photometric, and microcoulometric detectors. The GC techniques used in the analysis of organohalogen, organophosphorous and organonitrogen pesticides, pyrethrins, paraquat and diquat, phosphine (aluminum phosphide), polychlorinated biphenyls, methylmercury, and *N*-nitrosamines in foods are described. Other areas covered include the determination of those compounds naturally present in foods.

80-0900. Pflugmacher, J.; Ebing, W. (Inst. Pflanzenschutzmittelforsch., Biol. Bundesanstalt Land. & Forstwirtsch. Berlin, D-1000 Berlin 33, BRD) **Methode zur Bestimmung von Chlorkohlenwasserstoff-Insecticiden in Tabak mit Hilfe der Co-Sweep-distillation. [Sweep co-distillation cleanup of tobacco for determination of chlorinated hydrocarbon pesticides.]** *Z. Lebensm. Unters. Forsch.* 169(5): 343-345; 1979 (6 references) (German).

Recovery rates of pesticide residues from tobacco by the conventional co-sweep distillation method were found to be unsatisfactory. The low recovery rates result from a reaction of pesticides with natural constituent compounds of tobacco during the distillation process. The method was modified by incorporating an additional pre-cleanup step with a micro florisil column. Recoveries of pesticides added at levels of 0.05-0.3 mg/kg were between 78 and 98% after the modification, and were comparable to other commonly used methods. Pesticides used included HCB (hexachlorobenzene), HCH isomers (BHC isomers), heptachlor, aldrin, endosulfan, and ΣDDT.

See also 80-0604, 80-0617, 80-0641, 80-0699, 80-0700, 80-0724 *and* 80-0728.

PESTICIDES ABSTRACTS

QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Chemical Information Division, Office of Pesticides and Toxic Substances, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc.).

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